

11768

U.S. Army Center for Health Promotion and Preventive Medicine

**TRAINING MUNITIONS HEALTH RISK
ASSESSMENT
NO. 39-EJ-1485-00
RESIDENTIAL EXPOSURE FROM INHALATION OF
AIR EMISSIONS FROM THE
M862 5.56-MM PRACTICE CARTRIDGE
DEPARTMENT OF DEFENSE IDENTIFICATION CODE: A065**

Prepared by:

Environmental Health Risk Assessment Program

Prepared for:

U.S. Army Environmental Center

Published date:

15 June 2001

Approved for public release; distribution unlimited



U

S

C

H

P

P

M

20011218 132

Readiness Thru Health

U.S. Army Center for Health Promotion and Preventive Medicine

The lineage of the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) can be traced back over 50 years. This organization began as the U.S. Army Industrial Hygiene Laboratory, established during the industrial buildup for World War II, under the direct supervision of the Army Surgeon General. Its original location was at the Johns Hopkins School of Hygiene and Public Health. Its mission was to conduct occupational health surveys and investigations within the Department of Defense's (DOD's) industrial production base. It was staffed with three personnel and had a limited annual operating budget of three thousand dollars.

Most recently, it became internationally known as the U.S. Army Environmental Hygiene Agency (AEHA). Its mission expanded to support worldwide preventive medicine programs of the Army, DOD, and other Federal agencies as directed by the Army Medical Command or the Office of The Surgeon General, through consultations, support services, investigations, on-site visits, and training.

On 1 August 1994, AEHA was redesignated the U.S. Army Center for Health Promotion and Preventive Medicine with a provisional status and a commanding general officer. On 1 October 1995, the nonprovisional status was approved with a mission of providing preventive medicine and health promotion leadership, direction, and services for America's Army.

The organization's quest has always been one of excellence and the provision of quality service. Today, its goal is to be an established world-class center of excellence for achieving and maintaining a fit, healthy, and ready force. To achieve that end, the CHPPM holds firmly to its values which are steeped in rich military heritage:

★ *Integrity is the foundation*

★ *Excellence is the standard*

★ *Customer satisfaction is the focus*

★ *Its people are the most valued resource*

★ *Continuous quality improvement is the pathway*

This organization stands on the threshold of even greater challenges and responsibilities. It has been reorganized and reengineered to support the Army of the future. The CHPPM now has three direct support activities located in Fort Meade, Maryland; Fort McPherson, Georgia; and Fitzsimons Army Medical Center, Aurora, Colorado; to provide responsive regional health promotion and preventive medicine support across the U.S. There are also two CHPPM overseas commands in Landstuhl, Germany and Camp Zama, Japan who contribute to the success of CHPPM's increasing global mission. As CHPPM moves into the 21st Century, new programs relating to fitness, health promotion, wellness, and disease surveillance are being added. As always, CHPPM stands firm in its commitment to Army readiness. It is an organization proud of its fine history, yet equally excited about its challenging future.

| REPORT DOCUMENTATION PAGE | | | | Form Approved OMB No. 0704-0188 | |
|---|------------------|------------------------------------|---|--|---|
| <p>The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</p> <p>PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</p> | | | | | |
| 1. REPORT DATE (DD-MM-YYYY) 06-15-2001 | | 2. REPORT TYPE Technical Report | | 3. DATES COVERED (From - To) March 1999-August 2001 | |
| 4. TITLE AND SUBTITLE Training Munitions Health Risk Assessment No.39-EJ-1485-00 Residential Exposure from Inhalation of the Air Emissions from the M862 5.56mm Practice Cartridge, Department of Defense Identification Code: A065 | | | | 5a. CONTRACT NUMBER | |
| | | | | 5b. GRANT NUMBER | |
| | | | | 5c. PROGRAM ELEMENT NUMBER | |
| | | | | 5d. PROJECT NUMBER | |
| 6. AUTHOR(S) Hsieng-Ye Chang, Stafford D.F.R.Coakley | | | | 5e. TASK NUMBER | |
| | | | | 5f. WORK UNIT NUMBER | |
| | | | | | |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Center for Health Promotion and Preventive Medicine 5158 Blackhawk Road Aberdeen Proving Ground, Maryland 21010-5422 | | | | 8. PERFORMING ORGANIZATION REPORT NUMBER Risk Assessment # 39-EJ-1485-00 | |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Environmental Center ATTN: SFIM-AEC-PC Aberdeen Proving Ground, MD 21010-5401 | | | | 10. SPONSOR/MONITOR'S ACRONYM(S) USAEC | |
| | | | | 11. SPONSOR/MONITOR'S REPORT NUMBER(S) SFIM-AEC-PC-CR-200151 | |
| | | | | | |
| 12. DISTRIBUTION/AVAILABILITY STATEMENT Distribution Unlimited | | | | | |
| 13. SUPPLEMENTARY NOTES Point of Contact: Tamera Rush 410-436-6849 | | | | | |
| 14. ABSTRACT This assessment evaluated the potential for human health effects to offsite residents breathing air emissions following use of the 5.56mm Practice Cartridge. This document present the evaluation of the potential for adverse human health effects to teh offsite residents breathing air emissions following the use of military firing ranges during training exercises. Study results showed no protential for health risks to the hypothetical resident from inhalation of air emissions from the 5.56mm Cartridge. To conduct this study, air emissions from the 5.56mm Cartridge were collected in a test chamber (at Aberdeen Test Center, Aberdeen, MD). This information was then used in an air dispersion model to determine ambient air concentrations at a location downwind from the site where the item was activated. Modeled air concentrations were combined with exposure information to estimate the amount of substances the hypothetical resident breathes. This intake was combined with the substance's health information, to determine if there is a potential for health risks from inhjalation of these substances. The health risk included both long-term and short term exposures to the modeled substance concentrations. Study results showed no potential for helath risks from inhalation of air emissions from the 9mm Ball Cartridge. | | | | | |
| 15. SUBJECT TERMS emissions, aberdeen test center, characterization, health risk, munitions, firing point | | | | | |
| 16. SECURITY CLASSIFICATION OF: | | | 17. LIMITATION OF ABSTRACT UU | 18. NUMBER OF PAGES | 19a. NAME OF RESPONSIBLE PERSON Tamera Rush |
| a. REPORT U | b. ABSTRACT U | c. THIS PAGE U | | | 19b. TELEPHONE NUMBER (Include area code) 410-436-6849 |



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND, MARYLAND 21010-5403

MCHB-TS-EHR

TRAINING MUNITIONS HEALTH RISK ASSESSMENT NO. 39-EJ-1485-00
RESIDENTIAL EXPOSURE FROM INHALATION OF AIR EMISSIONS
FROM THE M862 5.56-MM PRACTICE CARTRIDGE

EXECUTIVE SUMMARY

This assessment evaluated the potential for human health effects to offsite residents breathing air emissions following use of the M862 5.56-mm Practice Cartridge (M862) on firing ranges during training exercises.

To conduct this assessment, air emissions from the M862 were collected in a test chamber at the U.S. Army Aberdeen Test Center, Maryland. The data collected from the Firing Point Emission Study provided the amount and types of substances released from the M862. This information was then used in an air dispersion model to determine ambient air concentrations at a location 100 meters (328 feet) downwind from a site where the M862 may be used. Since the training facility in this assessment is hypothetical, the air model used assumptions that provided conservative estimates of air concentrations.

Modeled air concentrations were combined with exposure information (e.g., number of cartridges used per year) to estimate the amount of each substance the hypothetical offsite resident breathes. This estimate was then compared with the substance's health information, which was obtained from agencies such as the U.S. Environmental Protection Agency, to determine if there is a potential for health risks from inhalation of these substances.

The health risk assessment included both long-term (30 years) and short-term (15-minute or 1-hour) exposures to modeled substance concentrations. Assessment results, generated using conservative methods, showed that the hypothetical offsite resident breathing air as close as 100 meters from the M862 firing location is safe from these emissions. It should be noted that at most training installations, training areas are over 1,000 meters (over half a mile) away from populated areas.

TABLE OF CONTENTS

| | |
|---|----|
| 1. PURPOSE..... | 1 |
| 2. AUTHORITY..... | 1 |
| 3. REFERENCES..... | 1 |
| 4. BACKGROUND..... | 1 |
| 4.1 CARTRIDGES AND THEIR USE | 1 |
| 4.2 WHAT IS THE M862?..... | 1 |
| 4.3 USE OF THE M862 | 1 |
| 4.4 ASSESSMENT SUMMARY | 2 |
| 5. DATA COLLECTION AND AIR MODELING..... | 3 |
| 5.1 EMISSION FACTORS..... | 3 |
| 5.2 BACKGROUND AND DESCRIPTION..... | 3 |
| 5.3 MODEL ASSUMPTIONS | 3 |
| 5.4 GENERAL METHODOLOGY..... | 5 |
| 5.5 USE OF MODEL OUTPUT | 5 |
| 5.6 DETERMINATION OF SUBSTANCE-SPECIFIC EMISSION RATES..... | 6 |
| 6. RISK ASSESSMENT..... | 7 |
| 6.1 EXPOSURE ASSUMPTIONS | 7 |
| 6.2 TIME-AVERAGING | 7 |
| 6.3 TOXICITY ASSESSMENT | 10 |
| 7. RISK CHARACTERIZATION | 14 |
| 7.1 CHRONIC HEALTH RISK..... | 14 |
| 7.2 ACUTE HEALTH RISK..... | 14 |
| 7.3 FACT SHEET | 14 |
| 8. UNCERTAINTY DISCUSSION..... | 14 |
| 9. CONCLUSION..... | 16 |
| 10. RECOMMENDATIONS | 16 |
| 11. POINT OF CONTACT | 17 |

LIST OF APPENDICES

| | |
|--|------------|
| REFERENCES | APPENDIX A |
| AIR DISPERSION MODELING OUTPUT DATA | APPENDIX B |
| HEALTH-BASED SCREENING LEVELS AND ACUTE TOXICITY VALUES | APPENDIX C |
| RISK ASSESSMENT DATA | APPENDIX D |
| FACT SHEET SUBMITTED TO THE U.S. ARMY ENVIRONMENTAL CENTER..... | APPENDIX E |

LIST OF TABLES

| | |
|---|----|
| TABLE 1 – SOURCE PARAMETERS | 4 |
| TABLE 2 – WORST-CASE METEOROLOGICAL PARAMETERS..... | 5 |
| TABLE 3 – AIR MODEL INPUT PARAMETERS | 5 |
| TABLE 4 – FREQUENCY OF USE FOR THE M862..... | 7 |
| TABLE 5 – EXPOSURE PARAMETERS USED TO DETERMINE TIME-AVERAGED CHRONIC AIR CONCENTRATIONS | 8 |
| TABLE 6 – SUMMARY OF RfCs USED FOR PETROLEUM HYDROCARBONS | 12 |
| TABLE 7– TYPES OF UNCERTAINTY | 15 |

LIST OF ACRONYMS

| | |
|-----------------|---|
| AEGL | Acute Exposure Guideline Levels |
| AIHA | American Industrial Hygiene Association |
| ATV | Acute Toxicity Value |
| CO ₂ | Carbon Dioxide |
| DODIC | Department of Defense Identification Code |
| DOE | U.S. Department of Energy |
| EPA | U.S. Environmental Protection Agency |
| ERPG | Emergency Response Planning Guidelines |
| HBSL | Health-Based Screening Level |
| INPUFF | Integrated PUFF Model |
| NAAQS | National Ambient Air Quality Standards |
| NEW | Net Explosive Weight |
| NH ₃ | Ammonia |
| OEL | Occupational Exposure Limit |
| PRG | Preliminary Remediation Goals |
| RBC | Risk-Based Concentration |
| RfC | Reference Concentration |
| TEEL | Temporary Emergency Exposure Limits |
| TPH | Total Petroleum Hydrocarbon |
| TSP | Total Suspended Particulates |
| USAATC | U.S. Army Aberdeen Test Center |
| USACHPPM | U.S. Army Center for Health Promotion and Preventive Medicine |
| USAEC | U.S. Army Environmental Center |

TRAINING MUNITIONS HEALTH RISK ASSESSMENT NO. 39-EJ-1485-00
RESIDENTIAL EXPOSURE FROM INHALATION OF AIR EMISSIONS FROM THE
M862 5.56-MM PRACTICE CARTRIDGE

1. PURPOSE

This document presents the assessment of the potential for human health effects to offsite residents breathing air emissions following use of the M862 5.56-mm Practice Cartridge (M862) during training exercises.

2. AUTHORITY

Memorandum, U.S. Army Environmental Center, 4 June 1999, Subject: Pyrotechnics Risk Assessment.

3. REFERENCES

See Appendix A for a list of references.

4. BACKGROUND

4.1 CARTRIDGES AND THEIR USE

Cartridges are cases that contain a primer, propelling charge, and projectile. The primer is needed to activate the propelling charge, which provides the force to send the projectile to a target. Examples of projectiles include bullets, rockets, and missiles. Cartridges are also referred to as "rounds" and are fired from weapons such as pistols or rifles.

4.2 WHAT IS THE M862?

The M862 is a training round used at training areas where firing of service ammunition (that which is intended for combat rather than for training) is not allowed. It is also referred to as a 5.56-mm short-range training ammunition. Each cartridge is about as long as a man's thumb. This cartridge can be identified by its blue tip (Reference 1).

4.3 USE OF THE M862

The M862 is fired from the M16 series rifles with the M2 practice bolt. It is most often used on indoor ranges or on local or urban training areas which do not allow the firing of service ammunition. Although the M862 can reach a maximum distance of 250 meters (820 feet), it is most effective as a training alternative to other service ammunition at a distance of 25 meters (82 feet) or less. This is because the round

behaves differently from other service ammunition at greater distances. Therefore, the M862 is typically used for firing exercises of 25 meters or less.

4.4 ASSESSMENT SUMMARY

The general assessment approach consisted of two main parts: air dispersion modeling and exposure assessment, which are briefly discussed in the paragraphs below. Sections 5 through 7 present a discussion of the methodology used for this assessment.

Emissions data used in the air dispersion modeling were obtained from the Firing Point Emission Study, conducted by the U.S. Army Aberdeen Test Center (USAATC), at Aberdeen Proving Ground, Maryland (References 2, 3). This study was funded by the U.S. Army Environmental Center (USAEC) with the purpose of identifying and quantifying emissions from weapons firing. Data from this study were generated by firing munitions in a test chamber using weapons that are representative of those used by the U.S. Army during training operations. Emissions data for the M862 were generated by firing it from the M16A2 rifle.

The emissions data for the M862 were used with an atmospheric dispersion model to estimate the average concentrations that might be experienced by an offsite resident. Since this assessment is designed to provide results that would be applicable to most Army training facilities, the training area used in this assessment was a hypothetical one. While most training areas are at least 1,000 meters away from populated areas, as a conservative distance, it was initially assumed that a person could reside 100 meters downwind from the firing point (location where the rifle is positioned). In addition, air-modeling parameters were selected to mimic worst-case conditions.

The exposure assessment included calculations of time-averaged concentrations for both long-term (chronic) and short-term (acute) exposures. For the purpose of this assessment, air concentrations were averaged over 30 years for chronic exposures and 1-hour or 15 minutes for acute exposures. Using a screening approach, a substance's estimated time-averaged air concentration was then compared to chronic health-based screening levels (HBSLs) established by the U.S. Environmental Protection Agency (EPA) or acute toxicity values (ATVs) established by selected agencies depending on the exposure duration (i.e., 30 years versus 1-hour or 15 minutes). The comparison was made using the ratio of the HBSL or ATV to the estimated air concentration for each of the substances evaluated. If this ratio was less than one, no further evaluation was required. This approach is conservative because the exposure assumptions used by the agencies, to establish HBSLs and ATVs, are likely to overestimate the exposures experienced by offsite residents living near firing ranges. If the chronic or acute averaged concentrations (C_{chronic} and C_{acute}) were greater than the screening levels, producing a ratio greater than one, further evaluation would be warranted to determine the potential for health effects. Note that concentrations greater than the screening levels do not indicate an onset of health effects, but rather, the potential for such.

5. DATA COLLECTION AND AIR MODELING

5.1 EMISSION FACTORS

Emission factors, used to derive the air modeling emission rates used in this assessment, were generated from the Firing Point Emission Study conducted by the USAATC. This study identified and quantified air emissions from the firing of training munitions. The data provided by USAATC included the net explosive weight (NEW), the substances sampled, and substance-specific emission factors. Emissions data from the Firing Point Emission Study are included in the first four columns of the table located in Appendix B.

5.2 BACKGROUND AND DESCRIPTION

Air dispersion models are available to mathematically simulate plume behavior and to estimate downwind concentrations of substances emitted from various sources. However, specific models are not available to determine the dispersion of emissions from munitions used during training. Estimating the magnitude and location of these concentrations depends on many factors including the amount and type of emissions, the behavior of the source, and meteorological conditions. Since a specific model is not available for modeling the use of munitions during training, the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) evaluated numerous air models to determine which would be suitable for use with munitions used during training. The USACHPPM recommended using the Integrated PUFF (INPUFF) model to estimate the dispersion of emissions from various munitions sources (Reference 4).

The INPUFF model (Reference 5) was developed to simulate dispersion from instantaneous or semi-continuous point sources. This Gaussian-integrated puff model is capable of addressing a cloud type release over short periods of time, and computations can be performed for a single point source for multiple receptors. The algorithms used to calculate concentrations assume a vertically uniform wind direction (with no chemical reaction) to compute the contribution of each cloud at a receptor for each time step/interval.

5.3 MODEL ASSUMPTIONS

Some assumptions were made to best represent the firing of M862 cartridges. These assumptions were as follows:

- Typically, with conventional point sources (such as incinerators), the cloud rise and formation are determined by characterizing flue gas exit velocity, temperature, and stack diameter. For unconventional sources with no real physical stack dimensions, such as the M16 series rifles, the stack height and diameter were determined to be equal to the height of the barrel and the bore diameter. No exit velocity was used with this source because the emissions rates generated from the test data were obtained from sampling a stabilized

cloud with no exit velocity. Table 1 includes the source parameters used to model the emissions from the M862 cartridges.

TABLE 1: SOURCE PARAMETERS

| Parameter | Model Input |
|--|---------------------------------------|
| Source/Stack Diameter | 0.00556 meters |
| Source/Stack Height | 1 meter |
| Source Exit Temperature | 298.15 degrees Kelvin (°K) (or 77 °F) |
| Exit Velocity | 0 meters/second |
| Initial horizontal dispersion coefficient (σ_y) | 0.96 meters |
| Initial vertical dispersion coefficient (σ_z) | 1.07 meters |

- Initial cloud dimensions are preferred to model the air emissions from these types of releases. Typically, these dimensions are used to define the initial horizontal and vertical dispersion values (σ_y and σ_z) of the released cloud. This information was not measured during the studies at USAATC; therefore, the cloud dimensions were based on the test chamber dimensions and the volume of air sampled. By assuming an elliptical cloud with the prevailing wind direction being perpendicular to the muzzle when fired, the test chambers radius would be equal to the initial vertical dispersion (σ_z), and the initial horizontal dispersion (σ_y), would be equal to one half the length of the test chamber. The cloud exit temperature was assumed equal to the test chamber temperature.
- For the purposes of this assessment, a hypothetical offsite resident was assumed located 100 meters directly downwind from the source. The meander of the cloud is a major factor when estimating concentrations at given locations downwind from the source. Assuming that the resident is directly downwind from the source is the same as assuming that there is no cloud meander and the center of the cloud migrates directly over the hypothetical offsite resident. This assumption provides the most conservative modeled concentrations.
- Since this assessment does not look at a specific training site, generic, worst-case meteorological data were used. To determine the worst-case meteorological conditions that would result in the highest air emission concentrations, the modeling was performed using the EPA Risk Management Program Guidance (Reference 6). This guidance includes tables for estimating the footprint of chemical releases and is intended to inform emergency responders of potential accidental releases. The EPA has

defined most default conditions for meteorological modeling parameters. Table 2 lists the meteorological parameters that were used in the air model for the M862.

TABLE 2: WORST-CASE METEOROLOGICAL PARAMETERS

| Parameter | Input Value |
|-----------------------|------------------------------------|
| Wind Speed | 1 meter/second |
| Atmospheric Stability | Category F |
| Wind Direction | 270° |
| Ambient Temperature | 293 degrees Kelvin (°K) (or 68 °F) |

5.4 GENERAL METHODOLOGY

The model was run for a total calculation time of 200 seconds to simulate a single round being fired and to ensure that the total mass of the cloud had passed the worst- case receptor location. Concentrations were calculated every two seconds. The model results indicated that the initial cloud reached the hypothetical offsite resident within 80 seconds and dissipated below the lowest concentration the model calculated, which in this instance (1×10^{-11} g/m³) occurred within 140 seconds. Table 3 contains the air model input parameters used in this assessment.

TABLE 3: AIR MODEL INPUT PARAMETERS

| Parameter | Input Value |
|---|-------------|
| Number of meteorological periods (NTIME) | 1 |
| Duration of each meteorological period (ITIME) | 200 seconds |
| Number of updates to the source (NSRCDS) | 100 |
| Duration/time step between each source update (ISUPDT) | 2 seconds |
| Total time modeled/Simulation Period (NTIME)(ITIME)= (NSRCDS)(ISUPDT) | 200 seconds |

5.5 USE OF MODEL OUTPUT

The concentrations provided by the INPUFF model were based on a unit emission rate of 1 gram/second from an emission source, and did not represent any substance-specific concentrations from the use of any weapons system. This unit emission rate is typically used for ease of modeling purposes. The relationship between the emission rate and predicted concentration is linear. Therefore, the ratio of the predicted concentration to the unit emission rate was multiplied by each substance-specific emission rate to provide substance-specific concentrations.

5.6 DETERMINATION OF SUBSTANCE-SPECIFIC EMISSION RATES

The actual substance emission rate for one cartridge (ER_1) for each substance was calculated using Equation 1. Example 1 provides a sample calculation using this equation.

$$ER_1 = \frac{EF \cdot CV}{t} \quad \text{Equation 1}$$

Where:

ER_1 = emission rate for one cartridge (g/sec)

EF = average adjusted emission factor (lb/item)

CV = conversion factor (453.59 g/lb)

t = release duration as obtained from the INPUFF Model (sec)

Example 1

Sample Calculation Using Equation 1:

$$ER_1 = \frac{(3.14 \text{ E} - 04)(453.59)}{(2)} \times 1 \text{ item}$$
$$= 7.120 \text{ E} - 02 \text{ g/sec}$$

Calculation provided for carbon dioxide (CO_2) from 5.56-mm(M862) round.
Appendix B contains the averaged adjusted emission factor of CO_2 in lb/item.

Substance-specific ambient concentrations for one item (CONC) were calculated using Equation 2. A sample calculation is provided in Example 2.

$$\text{CONC} = ER_1 \cdot \frac{UC}{ER_{\text{unit}}} \quad \text{Equation 2}$$

Where:

CONC = substance concentration based on one cartridge (g/m^3)

ER_1 = emission rate for one cartridge (g/sec)

ER_{unit} = unit emission rate as used in the model (g/sec)

UC = concentration based on the unit emission rate (g/m^3)

Example 2
Sample Calculation Using Equation 2:

$$CONC = (7.120E-01) \frac{(2.030E-04)}{(1)}$$

$$= 1.445E-05 \text{ g/m}^3$$

Calculation provided for CO₂.

6. EXPOSURE ASSESSMENT

6.1 EXPOSURE ASSUMPTIONS

Exposure assumptions were selected using a typical use scenario for the M862. The typical use scenario was provided USAEC and is based on consultation with their senior training advisor (References 7, 8). This information is included below in Table 4 and is used for the chronic and acute exposure assessments. The frequency of use for the M862 was required to determine how much substance an offsite resident would be exposed to in the time period of interest (i.e., acute or chronic exposure).

TABLE 4: FREQUENCY OF USE FOR THE M862

| Parameter | Values Used |
|--|-------------|
| Number of cartridges used per year | 100,000 |
| Maximum number of cartridges used in 1- hour | 1,000 |

6.2 TIME-AVERAGING

For the chronic assessment, time-averaged concentrations were calculated by assuming that the hypothetical resident would be exposed for 30 years. This is consistent with the exposure duration used by the EPA, which assumes that the resident spends 30 years at the same residence. By using the same exposure duration, the estimated time-averaged concentrations were compared with the selected HBSLs, which were derived using standard EPA default assumptions.

Using the default residence time established by the EPA, the assumption was made that someone would be exposed to air emissions from 100,000 cartridges per year for 30 years. Table 5 lists the exposure parameters used to estimate concentrations for the chronic assessment. These parameters are based on the typical use scenario provided by USAEC (Table 4) and the assumptions used in the air model run.

TABLE 5: EXPOSURE PARAMETERS USED TO DETERMINE TIME-AVERAGED CHRONIC AIR CONCENTRATIONS

| Exposure Parameter | Value Used |
|--|---------------------------------|
| Exposure Time (ET _{ctg}) | 3.33 min/cartridge ¹ |
| Exposure Frequency (EF _{ctg}) | 100,000 cartridges/year |
| Exposure Duration (ED) | 30 years ² |
| ¹ Based on the total model time of 200 seconds (3.33 minutes) used in the air model run. Refer to Table 3 for Air Model Input Parameters. | |
| ² EPA default value. | |

Chronic averaged concentrations were calculated using Equation 3. Example 3 shows how this calculation was performed, using the CO₂ concentration as an example. Carbon dioxide is classified as a noncarcinogen, as indicated in Appendix C; therefore, the averaging time is the exposure duration as indicated.

$$C_{chronic} = \frac{CONC \cdot 10^6 \cdot ET_{ctg} \cdot EF_{ctg} \cdot ED}{525,600 \cdot AT} \quad \text{Equation 3}$$

Where:

- $C_{chronic}$ = average chronic concentration (µg/m³)
- CONC = average modeled concentration for one cartridge (g/m³)
- 10^6 = unit conversion (µg/g)
- ET_{ctg} = exposure time per cartridge (minutes/cartridge)
- EF_{ctg} = exposure frequency per year (cartridges/year)
- ED = exposure duration (years)
- 525,600 = unit conversion (minutes/year)
- AT = averaging time (years)
(carcinogenic endpoint: AT = 70 years
noncarcinogenic endpoint: AT = ED)

Example 3
Sample Calculation Using Equation 3:

$$C_{chronic(CO_2)} = \frac{(1.445E-05)(10^6)(3.333)(100,000)(30)}{(525,600)(30)}$$

$$= 9.16E+00 \mu\text{g}/\text{m}^3$$

Appendix B contains the average modeled concentration for one cartridge (CONC) and Table 5 provides the exposure parameters.

Unlike the chronic assessment, only limited guidance for evaluating acute exposures is currently available. However, since many cartridges may be fired in a short period of time, acute exposures cannot be overlooked. For the purpose of this assessment, acute exposure is defined as a 1-hour or 15-minute exposure. The 1-hour or 15-minute acute exposure averaging times allow for comparison with guidelines developed specifically for emergency planning purposes (see discussion on acute toxicity below).

The exposure frequency is based on the number of cartridges used per 1-hour or 15 minutes depending on the guideline used for comparison. This information is based on the use scenario provided by the USAEC (Table 4). To estimate air concentrations for potential acute health impacts, it was conservatively assumed that 1,000 M862s are fired in 1- hour. The average acute concentrations were computed using Equation 4. Example 4 contains a sample calculation of this equation.

$$C_{acute} = \frac{CONC \cdot 10^6 \cdot ET_{ctg} \cdot EF_{ctg}}{60} \quad \text{Equation 4}$$

Where:

C_{acute} = average acute concentration ($\mu\text{g}/\text{m}^3$)
 $CONC$ = average modeled concentration for one cartridge (g/m^3)
 10^6 = unit conversion ($\mu\text{g}/\text{g}$)
 ET_{ctg} = exposure time per cartridge (minutes/cartridge)
 EF_{ctg} = exposure frequency (cartridges/hour)*
 60 = unit conversion, 60 minutes/hour

* Based on 1- hour or 15 minute (0.25 hour) acute toxicity value

Example 4
Sample Calculation Using Equation 4:

$$C_{acute(\text{CO}_2)} = \frac{(1.445\text{E} - 05)(10^6)(3.33)(1000)(1/0.25)}{(60)}$$

$$= 3.21\text{E}+03 \mu\text{g}/\text{m}^3$$

Appendix B provides the average modeled concentration for one cartridge ($CONC$) for CO_2 . Since the acute toxicity value of CO_2 is based on a 15-minute exposure, the average acute concentration of CO_2 was adjusted by a factor of 1/0.25.

6.3 TOXICITY ASSESSMENT

The potential for health effects was determined by comparing time-averaged air concentrations to HBSLs and ATVs, which are developed from a substance's known toxicity. These toxicity values typically include different levels of safety factors depending on the level of confidence of the critical study. Appendix C contains a table of screening toxicity levels used for the chronic and acute assessments.

6.3.1 CHRONIC ASSESSMENT

The chronic assessment was conducted using a screening approach. Using this method, a substance's estimated time-averaged air concentration was compared to its HBSL by using the ratio of the HBSL to the estimated concentration. If this ratio was less than one, no further evaluation was necessary. This approach is conservative because the exposure assumptions used by the EPA, to establish HBSLs, assume that the resident is continuously exposed for 350 days per year (assuming 2 weeks vacation per year). In contrast, exposure to air emissions from actual training activities at a firing range is intermittent and is not likely to occur on a daily basis year round.

A hierarchy of sources was developed for selection of the HBSLs to quantitatively evaluate as many of the identified substances as possible. The hierarchy of sources used was as follows:

- Clean Air Act, EPA National Ambient Air Quality Standards (NAAQS) (Reference 11)
- EPA Region 9 Preliminary Remediation Goals (PRGs) (Reference 10)
- EPA Region 3 Risk-Based Concentrations (RBCs) (Reference 9)

Some substances have neither PRGs nor RBCs because they have their own set of regulatory standards. Under the Clean Air Act, the EPA is required to establish NAAQS for several substances considered harmful to public health and the environment. Currently, NAAQS are available for seven substances. The NAAQS for the longer averaging time were used for the chronic assessment. Depending on the substance, this can range from an 8-hour average to an annual average. In addition, since the majority of the measured total suspended particulates (TSP) were PM₁₀ (particulate matter under 10 microns in size) (Reference 3), the NAAQS for PM₁₀ was used to evaluate the potential for health effects from exposure to TSP.

Next on the hierarchy, after the NAAQS, are the EPA Region 9 PRGs and the EPA Region 3 RBCs. Since the methodology used by EPA Region 9 to develop the PRGs generally results in lower values than the EPA Region 3, the PRGs were first on the hierarchy of sources. Region 3's RBCs were used when a PRG was not available. To ensure that the most recent information was used, the Internet sites of both EPA

Regions were checked. The HBSLs used for this assessment are presented in Appendix C.

Although the general approach used by both EPA Region 3 and Region 9 is the same, the exposure assumptions differ enough so that final recommended values can vary to a certain degree. In both methods, a substance's screening concentration was selected using the toxicity endpoint that derives a lower concentration. For example, if a substance has a known systemic toxicity and is a carcinogen, the screening concentration was calculated using both toxicity values. To maintain a conservative approach, EPA then selected the lower screening concentration as the recommended PRG or RBC.

Example 5 shows a sample calculation of how a substance's estimated chronic concentration was compared to its HBSL. Since CO₂ does not have an HBSL, ammonia NH₃ was used as the example substance.

Example 5
Sample Calculation Comparing a Substance's Estimated Chronic Concentration to Its HBSL:

$$\frac{C_{\text{chronic(NH}_3\text{)}}}{\text{HBSL}} = \frac{5.02\text{E} - 02}{1.04\text{E} + 02}$$
$$= 4.81\text{E} - 04 < 1$$

In this case, the resulting ratio is less than one, indicating further evaluation is not necessary.

Many petroleum hydrocarbons were detected but do not have specific screening levels. Therefore, the approach recommended by the Total Petroleum Hydrocarbon Criteria Working Group (Reference 12) was adopted to evaluate petroleum hydrocarbon mixtures. Based on the working group's assessment of various hydrocarbons, it was recommended that mixtures be separated according to a substance's number of carbons and its chemical class (i.e., aliphatic or aromatic¹). Generally, as a substance's carbon number increases, its molecular weight increases, and it is, therefore, not a substance of concern via inhalation. The working group also concluded that aromatic hydrocarbons tend to be more toxic than aliphatic hydrocarbons (Reference 12). Table 6 presents the inhalation toxicity values used to evaluate exposure to petroleum mixtures. To be consistent with the methodology used in this assessment, the reference concentrations (RfCs) were converted to PRGs using

¹ Aliphatic hydrocarbons are hydrocarbons in which the carbon atoms are joined by single covalent bonds consisting of two shared electrons (e.g., butane). Aromatic hydrocarbons have ring structures (e.g., benzene) (Reference 13).

EPA Region 9 exposure assumptions. The resulting PRGs were used as the HBSLs for the petroleum hydrocarbons in this assessment. These values are presented in Appendix D.

TABLE 6: SUMMARY OF RfCs USED FOR PETROLEUM HYDROCARBONS¹

| Carbon Range | Aromatic Inhalation RfC (mg/m ³) | Aliphatic Inhalation RfC (mg/m ³) |
|--|---|--|
| C ₅ – C ₆ C _{>6} – C ₈ | | 18.4 |
| C _{>7} – C ₈ | 0.4 | |
| C _{>8} – C ₁₀ C _{>10} – C ₁₂ C _{>12} – C ₁₆ | 0.2 | 1.0 |
| C _{>16} – C ₂₁ C _{>21} – C ₃₅ | NA | NA |

¹Reference 13
NA = not applicable for high molecular weight TPHs (Total Petroleum Hydrocarbons) (C_{>16}) because substances in this carbon range are not volatile and therefore, inhalation is not a pathway of concern.

6.3.2 ACUTE ASSESSMENT

An established method for assessing acute health effects is not currently available. In 1995, the EPA recognized the need for acute exposure guidelines for emergency response purposes and created the National Advisory Committee for Acute Exposure Guideline Levels (AEGLs) for Hazardous Substances. Currently, AEGLs are available for only a few substances

To overcome the absence of acute toxicity data for the purposes of human health risk assessment, several state regulatory agencies have suggested that guidelines developed for emergency purposes be used in the interim. Although suggestions have been made to use occupational exposure limits (OELs) by applying additional safety factors (References 14, 15), OELs were not used in this assessment because they introduce even more uncertainty than the use of emergency guidelines. The OELs are designed to protect the workplace environment, and assume 8 hours a day, 5 days a week exposures. By definition, these exposures are more chronic than acute.

In comparison, emergency planning guidelines are more appropriate because they are typically developed for exposures of 1-hour or less. In addition, safety factors are included as part of the guideline development so that the values would be protective of the general population.

Emergency Response Planning Guidelines (ERPGs) published by the American Industrial Hygiene Association (AIHA) (Reference 16) and the Temporary

Emergency Exposure Limits (TEELs) developed by the U.S. Department of Energy (DOE) (Reference 17) were used for this assessment, specifically the ERPG-1s and the TEEL-1s. Since TEEL-1s are intended for exposures up to 15-minutes, air concentrations compared to TEELs were averaged over a 15-minute period. Air concentrations compared to ERPGs and AEGLs were averaged over 1-hour as these values are intended for 1-hour exposures.

For this assessment, the hierarchy of sources for ATV selection was as follows with each ATV defined below:

- EPA AEGL-1. "AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic, nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure."
- AIHA ERPG-1. "The maximum concentration in air below which it is believed nearly all individuals could be exposed for up to 1- hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor."
- DOE TEEL-1. "The maximum concentration in air below which it is believed nearly all individuals could be exposed without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor."

AEGLs were used first when available since they are developed specifically for the purpose of acute exposure assessments. The ERPGs were selected next, prior to a substance's TEEL, because they are vigorously reviewed before they are published whereas the TEELs are not.

Example 6 shows a sample calculation of how a substance's estimated acute concentration was compared to its ATV.

Example 6

Sample Calculation Comparing a Substance's Estimated Acute Concentration to Its ATV:

$$\frac{C_{acute(CO2)}}{ATV} = \frac{3.21E+03}{5.40E+07}$$
$$= 5.95E-05 < 1$$

In this example, the ratio is less than one, indicating that further evaluation is not necessary.

7. RISK CHARACTERIZATION

As previously described, the exposure assessment included calculations of time-averaged concentrations for both long-term (chronic) and short-term (acute) exposures. Using a screening approach, a substance's estimated time-averaged air concentration was then compared to chronic HBSLs or ATVs. The comparison was made using the ratio of the HBSL or ATV to the estimated concentration. This approach is conservative because the exposure assumptions used by the EPA, to establish HBSLs and ATVs, are likely to overestimate the exposures experienced by offsite residents living near firing ranges.

If this ratio was less than one, no further evaluation was needed. If the chronic or acute averaged concentrations (C_{chronic} and C_{acute}) were greater than the screening levels, resulting in a ratio greater than one, further evaluation would be warranted to determine the potential for health effects. Note that concentrations greater than the screening levels do not indicate an onset of health effects, but rather, the potential for such.

The chronic and acute assessments were conducted as outlined in Section 6.3. Appendix D presents results from the M862 risk characterization.

7.1 CHRONIC HEALTH RISK

The outcome of the chronic assessment indicated that no chronic health effects are expected from breathing the air emissions from the M862. Since the ratios for all substances were below one, no further evaluation was needed.

7.2 ACUTE HEALTH RISK

For the acute analysis, all ratios were below one, indicating that no acute health effects are expected from breathing the air emissions from the M862. Since the ratios for all substances were below one, no further evaluation was needed.

7.3 FACT SHEET

Appendix E includes a copy of the fact sheet submitted to the USAEC. The fact sheet uses the results from this assessment to address health concerns related to inhalation of M862 air emissions.

8. UNCERTAINTY DISCUSSION

The limitations inherent in modeling and the added conservatism of the assessment contribute to the uncertainty of the assessment results. The risk assessment methodology typically includes safety factors that are embedded in the toxicity data to ensure adequate protection of the general population, particularly, susceptible

individuals such as the sick, elderly, and children. Table 7 identifies areas of uncertainty associated with this assessment.

TABLE 7: TYPES OF UNCERTAINTY

| Issue | Uncertainty | Direction of Effect |
|---|--|----------------------------|
| Ambient Air Emissions Modeling | | |
| Modeled versus real-time sampling | The air concentrations in this assessment were modeled. Actual air concentrations taken from the field may be higher or lower. | Varies |
| Frequency of use for the M862 | Actual frequency of use for these munitions during training exercises may be different from those stated in this report. | Varies |
| Hypothetical resident assumed to be located directly downwind | Unless the area around the training facility is populated, the chances that a person living directly downwind is low. | Overestimates |
| Use of worst-case meteorological conditions | To ensure that this assessment is applicable to most training areas, worst-case meteorological conditions were used in the air model. | Overestimates |
| Exposure Assessment | | |
| Estimating time-averaged concentrations | Actual exposure from the M862 is intermittent. If one were to plot a person's exposure profile, the plot would consist of a series of spikes. Since current risk assessment methodology does not allow the evaluation of the potential for health risks as a function of time, a single concentration, averaged over the exposure duration was used. In this assessment, the exposure durations used were 30 years and 1-hour or 15 minutes. | Varies |
| Comparing estimated concentration to established screening levels | The Region 3 and Region 9 HBSLs were developed assuming that the resident is exposed 350 days a year. It is unlikely for training with the M862 to occur for 350 days a year at a particular firing range. | Overestimates |

TABLE 7: TYPES OF UNCERTAINTY

| Issue | Uncertainty | Direction of Effect |
|--|--|----------------------------|
| Comparing estimated concentrations to established screening levels | Comparison to screening levels does not account for possible cumulative effects of exposure to more than one substance. | Underestimates |
| Screening assessment versus calculating an average daily intake | Calculating an average daily intake allows the use of scenario-specific assumptions. However, unless the ratio of concentration to screening level approaches one, a screening assessment is useful as a first-cut evaluation. | Varies |
| Exposure to other munitions | Other munitions are typically used during the same training exercise. These items may contain similar or different substances from those detected in the M862. | Underestimates |
| Toxicity Assessment | | |
| Lack of toxicity data | Some substances were not quantitatively evaluated because they have no known toxicity data. | Underestimates |
| Modifying and uncertainty factors for toxicity data | Modifying factors and uncertainty factors of varying degree are typically applied to toxicological values. These factors are used to conservatively account for extrapolating from animal studies for human health evaluation, and to conservatively account for variation in human populations. | Overestimates |

9. CONCLUSION

Using conservative assumptions, the assessment indicated that offsite residents who live as close as 100 meters directly downwind from training areas are safe from breathing air emissions from the M862. It is believed that the assumptions contained in this assessment are conservative enough to be protective of all the population including the sick, elderly, and children.

10. RECOMMENDATIONS

The results from this assessment are intended for a hypothetical training facility, and actual results may vary depending on site-specific conditions. This assessment used

conservative assumptions (e.g., worst-case meteorological conditions, receptor located directly downwind, etc.) and it is believed that most site-specific analyses would result in even lower concentrations. Therefore, the results from this assessment should be applicable to most training facilities unless site-specific conditions vary significantly.

11. POINT OF CONTACT

Questions about this report may be directed to Ms. Joleen Mobley at (800) 222-9698 (ext 2953) or (410) 436-2953.

PREPARED BY:

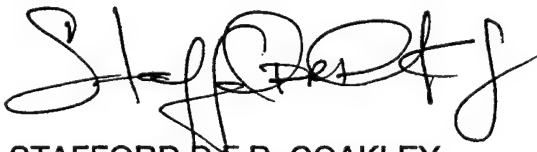


HSIENG-YE CHANG, P.E.
Environmental Engineer
Environmental Health Risk Assessment
Program

APPROVED BY:



DAVID L. DAUGHDRILL
Program Manager
Environmental Health Risk Assessment



STAFFORD D.F.R. COAKLEY
Environmental Engineer
Environmental Health Risk Assessment
Program

APPENDIX A

REFERENCES

1. U.S. Army (1994). *Technical Manual, Army Ammunition Data Sheets for Small Caliber Ammunition*. TM-43-0001-27.
2. U.S. Army (2000). *Draft, Detailed Test Plan No. 3 for the Firing Point Emission Study Phase II*. Prepared by the Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, for U.S. Army Environmental Center, Aberdeen Proving Ground, MD.
3. U.S. Army. Email communication between Ms. Tamera Clark-Rush, AEC, and Ms. Hsieng-Ye Chang, USACHPPM, 16 August 2000.
4. USACHPPM (August 2000). *Ambient Air Quality Consultation NO. 43-EL-1485-00 Air Dispersion Modeling Evaluation for Military Munitions*, Aberdeen Proving Ground, MD.
5. Bowman Environmental, Inc. (1999). *INPUFF2, Multiple Source Integrated Puff Model*, Version 4.1.
6. Title 40, Code of Federal Regulations, Part 68 (40 CFR 68), Chemical Accident Prevention Provisions, 1 July 1998.
7. U.S. Army. Email communication between Ms. Tamera Clark-Rush, AEC, and Ms. Hsieng-Ye Chang, USACHPPM, 12 September 2000.
8. Army Training Evaluation Protocol (ARTEP) 7-20-MTP, *Mission Training Plan for the Infantry Battalion*.
9. EPA (April 1999). *Region 3 Risk Based Concentration (RBC) Tables*. Available online at www.epa.gov/reghwmd/risk/riskmenu.htm
10. EPA (Oct. 1999). *Region 9 Preliminary Remediation Goals (PRG)*. Available online at www.epa.gov/region09/waste/sfund/prg/index.html
11. EPA. *National Ambient Air Quality Standards*. Available online at <http://www.epa.gov/airprogm/airs/criteria.html>
12. Total Petroleum Hydrocarbon Criteria Working Group (1997). *Development of Fraction Specific Reference Doses (RfDs) and Reference Concentrations (RfCs) for Total Petroleum Hydrocarbons (TPH)*, Volume 4. Amherst Scientific Publishers. Amherst, MA.
13. Manahan, Stanley (1994). *Environmental Chemistry*. Sixth edition. CRC Press, Inc. Boca Raton, FL.
14. U.S. Army (1996). *Final Screening Risk Assessment for the Anniston Chemical Agent Disposal Facility at the Anniston Army Depot, Alabama*. Revision No. 5. Prepared

by the U.S. Army Center for Health Promotion and Preventive Medicine for the Program Manager for Chemical Demilitarization. Aberdeen Proving Ground, Maryland.

15. U.S. Army (1997). *Final Screening Risk Assessment for the Pine Bluff Chemical Agent Disposal Facility at the Pine Bluff Arsenal, Arkansas*. Revision No. 1. Prepared by the U.S. Army Center for Health Promotion and Preventive Medicine for the Program Manager for Chemical Demilitarization. Aberdeen Proving Ground, Maryland.

16. American Industrial Hygiene Association (AIHA) (1999). *Emergency Response Planning Guidelines*. AIHA Press, Fairfax, VA.

17. Department of Energy (1998). *Temporary Emergency Exposure Limits*, Revision 15. <http://www.scapa.bnl.gov>.

APPENDIX B

AIR DISPERSION MODELING OUTPUT DATA

Table B-1: Air Modeling Output Data

| Cartridge, 5.56mm Bsl Practice, M802 (M16A1) | | | | | | | | | |
|--|--|--|--|--|---|--|--|-----------------------|-----------|
| DODIC: A065 | | | | | | | | | |
| Number of Items tested = 30 | | | | | | | | | |
| Net Explosive Weight (lbs) = 8.58E-04 | | | | | | | | | |
| Compound | ATC Firing Test Results ¹ | | | | | | | Number of Rounds (I): | |
| | Measured Actual Concentration (mg/m ³) | Measured Background Concentration (mg/m ³) | Average Adjusted Emission Factor (lb/item) | Average Adjusted Emission Factor (lb/lb NEW) | Total Mass of Substance Emittied (grams/item) | Average Modeled Concentration for One Item (grams/m ³) | Pollutant Emission Rate for One Item (g/sec) | 1 round | 2 seconds |
| Permanent Gases | | | | | | | | | |
| Ammonia (NH ₃) | 3.50E+00 | NA | 1.72E-06 | 2.00E-03 | 7.80E-04 | 7.915E-08 | 3.90E-04 | | |
| Carbon Dioxide (CO ₂) | 6.39E+02 | NA | 3.14E-04 | 3.66E-01 | 1.42E-01 | 1.445E-05 | 7.12E-02 | | |
| Carbon Monoxide (CO) | 8.06E+02 | NA | 3.96E-04 | 4.61E-01 | 1.80E-01 | 1.822E-05 | 8.98E-02 | | |
| Oxides of Nitrogen (NOx) | 2.46E+01 | NA | 1.21E-05 | 1.41E-02 | 5.48E-03 | 5.563E-07 | 2.74E-03 | | |
| Sulfur Dioxide (SO ₂) | 2.62E-01 | NA | 1.29E-07 | 1.50E-04 | 5.84E-05 | 5.925E-09 | 2.92E-05 | | |
| Acid Gases | | | | | | | | | |
| Hydrogen Fluoride | 2.35E-01 | 2.20E-01 | ND | ND | ND | ND | ND | | |
| Hydrogen Chloride | 2.30E-01 | 2.10E-01 | ND | ND | ND | ND | ND | | |
| Hydrogen Bromide | 2.30E-01 | 2.10E-01 | ND | ND | ND | ND | ND | | |
| Nitric Acid | 1.46E+00 | 2.10E-01 | 1.24E-06 | 1.44E-03 | 5.62E-04 | 5.699E-08 | 2.81E-04 | | |
| Phosphoric Acid | 2.30E-01 | 2.10E-01 | ND | ND | ND | ND | ND | | |
| Sulfuric Acid | 2.90E-01 | 2.10E-01 | 2.19E-07 | 2.55E-04 | 9.93E-05 | 1.008E-08 | 4.96E-05 | | |
| Cyanide | | | | | | | | | |
| Particulate Cyanide | 2.20E-02 | 1.20E-02 | 9.17E-09 | 1.07E-05 | 4.16E-06 | 4.224E-10 | 2.06E-06 | | |
| Hydrogen Cyanide | 2.42E+00 | 1.30E-02 | 1.30E-06 | 1.52E-03 | 5.89E-04 | 5.983E-08 | 2.95E-04 | | |
| Particulates | | | | | | | | | |
| Total Suspended Particulate | 2.29E+01 | NA | 1.23E-05 | 1.44E-02 | 5.59E-03 | 5.675E-07 | 2.80E-03 | | |
| Particulate Matter <10 microns | 2.24E+01 | NA | 1.21E-05 | 1.41E-02 | 5.47E-03 | 5.548E-07 | 2.73E-03 | | |
| Particulate Matter <2.5 microns | 2.00E+01 | NA | 1.07E-05 | 1.25E-02 | 4.87E-03 | 4.946E-07 | 2.44E-03 | | |
| Metals | | | | | | | | | |
| Aluminum | 1.86E-01 | 5.63E-02 | 1.00E-07 | 1.17E-04 | 4.55E-05 | 4.614E-09 | 2.27E-05 | | |
| Antimony | 3.58E+00 | 3.55E-01 | 1.75E-06 | 2.04E-03 | 7.95E-04 | 8.069E-08 | 3.98E-04 | | |
| Arsenic | 1.38E-02 | 1.41E-02 | 7.34E-09 | 8.56E-06 | 3.33E-06 | 3.379E-10 | 1.66E-06 | | |
| Barium | 3.28E+00 | 5.63E-02 | 1.76E-06 | 2.06E-03 | 8.00E-04 | 8.122E-08 | 4.00E-04 | | |
| Beryllium | 5.51E-02 | 5.63E-02 | ND | ND | ND | ND | ND | | |
| Cadmium | 5.51E-02 | 5.63E-02 | ND | ND | ND | ND | ND | | |
| Calcium | 3.45E-01 | 1.09E-01 | 1.32E-07 | 1.53E-04 | 5.97E-05 | 6.061E-09 | 2.99E-05 | | |

Table B-1: Air Modeling Output Data

| Cartridge, 5.56mm Bsl Practice, M862 (M16A1) | | | | | | | | | |
|--|--|--|--|--|--|--|--|---------|--|
| DODIC: A065 | | | | | | | | | |
| Number of Items tested = 30 | | | | | | | | | |
| Net Explosive Weight (lbs) = 8.58E-04 | | | | | | | | | |
| Compound | ATC Firing Test Results | | | | | Number of Rounds (I): | | 1 round | |
| | Measured Actual Concentration (mg/m ³) | Measured Background Concentration (mg/m ³) | Average Adjusted Emission Factor (lb/item) | Average Adjusted Emission Factor (lb/lb NEW) | Total Mass of Substance Emitted (grams/item) | Average Modeled Concentration for One Item (grams/m ³) | Pollutant Emission Rate for One Item (g/sec) | | |
| Chromium | 5.51E-02 | 5.63E-02 | ND | ND | ND | ND | ER ₁ | ND | |
| Cobalt | 5.51E-02 | 5.63E-02 | ND | ND | ND | ND | ND | ND | |
| Copper | 4.54E-01 | 8.05E-02 | 2.05E-07 | 2.39E-04 | 9.28E-05 | 9.421E-09 | 4.64E-05 | ND | |
| Lead | 6.15E+00 | 5.63E-02 | 3.31E-06 | 3.85E-03 | 1.50E-03 | 1.522E-07 | 7.50E-04 | ND | |
| Magnesium | 5.51E-02 | 5.63E-02 | ND | ND | ND | ND | ND | ND | |
| Manganese | 5.51E-02 | 5.63E-02 | ND | ND | ND | ND | ND | ND | |
| Nickel | 5.51E-02 | 5.63E-02 | ND | ND | ND | ND | ND | ND | |
| Selenium | 1.38E-02 | 1.41E-02 | ND | ND | ND | ND | ND | ND | |
| Silver | 5.51E-02 | 5.63E-02 | ND | ND | ND | ND | ND | ND | |
| Thallium | 5.51E-02 | 5.63E-02 | ND | ND | ND | ND | ND | ND | |
| Vanadium | 5.51E-02 | 5.63E-02 | ND | ND | ND | ND | ND | ND | |
| Zinc | 1.79E-01 | 5.63E-02 | 9.61E-08 | 1.12E-04 | 4.36E-05 | 4.425E-09 | 2.18E-05 | ND | |
| TO-11 Carbonyls | | | | | | | | | |
| Formaldehyde | 9.83E-02 | 1.23E-01 | 5.29E-08 | 6.16E-05 | 2.40E-05 | 2.434E-09 | 1.20E-05 | ND | |
| Acetaldehyde | 1.80E-01 | 1.80E-01 | ND | ND | ND | ND | ND | ND | |
| Acetone | 1.19E+00 | 1.19E+00 | ND | ND | ND | ND | ND | ND | |
| Acrolein | 2.29E-02 | 2.29E-01 | 1.22E-08 | 1.43E-05 | 5.55E-06 | 5.628E-10 | 2.77E-06 | ND | |
| Propionaldehyde | 2.37E-01 | 2.37E-01 | ND | ND | ND | ND | ND | ND | |
| Crotonaldehyde | 2.87E-01 | 2.87E-01 | ND | ND | ND | ND | ND | ND | |
| Butyraldehyde | 2.95E-01 | 2.95E-01 | ND | ND | ND | ND | ND | ND | |
| Benzaldehyde | 4.34E-01 | 4.34E-01 | ND | ND | ND | ND | ND | ND | |
| Isovaleraldehyde | 3.52E-01 | 3.52E-01 | ND | ND | ND | ND | ND | ND | |
| Valeraldehyde | 3.52E-01 | 3.52E-01 | ND | ND | ND | ND | ND | ND | |
| o,m,p-Tolualdehyde | 4.91E-01 | 4.91E-01 | ND | ND | ND | ND | ND | ND | |
| Hexaldehyde | 4.10E-01 | 4.10E-01 | ND | ND | ND | ND | ND | ND | |
| 2,5-Dimethylbenzaldehyde | 4.10E-01 | 4.10E-01 | ND | ND | ND | ND | ND | ND | |
| VOCs | | | | | | | | | |
| Propene | 8.61E-02 | 1.72E-03 | 4.63E-08 | 5.40E-05 | 2.10E-05 | 2.132E-09 | 1.05E-05 | ND | |
| Dichlorodifluoromethane | 2.47E-03 | 2.97E-03 | ND | ND | ND | ND | ND | ND | |

Table B-1: Air Modeling Output Data

| Compound | Cartridge, 5.56mm Bsl Practice, M862 (M16A1) | | | | | Number of Rounds (I): | | Pollutant | |
|--------------------------|--|---|--|--|----------|--|---|---------------------------|----|
| | DODIC: A065 | | | | | Release duration (I): | | Emission Rate | |
| | Number of Items tested = 30 | | | | | Unit Concentration (UC): | | for One Item | |
| | Net Explosive Weight (lbs) = 8.58E-04 | | | | | | | (g/m ³)/(g/s) | |
| | ATC Firing Test Results ¹ | | | | | Total Mass of Substance Emitted (grams/item) | Average Modeled Concentration for One Item (grams/m ³) | ER ₁ | |
| | Measured Actual Concentration (mg/m ³) | Measured Background Concentration (mg/m ³) | Average Adjusted Emission Factor (lb/item) | Average Adjusted Emission Factor (lb/lb NEW) | M | | | | |
| Chlorodifluoromethane | 3.54E-03 | 3.54E-03 | ND | ND | ND | ND | ND | ND | ND |
| Freon 114 | 6.99E-03 | 6.99E-03 | ND | ND | ND | ND | ND | ND | ND |
| Chloromethane | 1.03E-03 | 2.07E-03 | 5.50E-10 | 6.41E-07 | 2.50E-07 | 2.53E-11 | 1.25E-07 | ND | ND |
| Vinyl Chloride | 2.56E-03 | 2.56E-03 | ND | ND | ND | ND | ND | ND | ND |
| 1,3-Butadiene | 2.21E-03 | 2.21E-03 | ND | ND | ND | ND | ND | ND | ND |
| Bromomethane | 3.88E-03 | 3.88E-03 | ND | ND | ND | ND | ND | ND | ND |
| Chloroethane | 2.64E-03 | 2.64E-03 | ND | ND | ND | ND | ND | ND | ND |
| Dichlorofluoromethane | 4.21E-03 | 4.21E-03 | ND | ND | ND | ND | ND | ND | ND |
| Trichlorofluoromethane | 1.40E-03 | 1.69E-03 | ND | ND | ND | ND | ND | ND | ND |
| Pentane | 2.95E-03 | 2.95E-03 | ND | ND | ND | ND | ND | ND | ND |
| Acrolein | 1.36E-01 | 2.29E-03 | 7.34E-08 | 8.56E-05 | 3.33E-05 | 3.37E-09 | 1.66E-05 | ND | ND |
| 1,1-Dichloroethene | 4.05E-03 | 4.05E-03 | ND | ND | ND | ND | ND | ND | ND |
| Freon 113 | 7.68E-03 | 7.68E-03 | ND | ND | ND | ND | ND | ND | ND |
| Acetone | 7.84E-02 | 7.13E-03 | 3.86E-08 | 4.50E-05 | 1.75E-05 | 1.77E-09 | 8.75E-06 | ND | ND |
| Methyl Iodide | 5.81E-03 | 5.81E-03 | ND | ND | ND | ND | ND | ND | ND |
| Carbon Disulfide | 1.09E-02 | 3.11E-03 | 5.87E-09 | 6.85E-06 | 2.66E-06 | 2.704E-10 | 1.33E-06 | ND | ND |
| Acetonitrile | 1.76E-01 | 5.04E-03 | 9.24E-08 | 1.08E-04 | 4.19E-05 | 4.255E-09 | 2.10E-05 | ND | ND |
| 3-Chloropropene | 3.13E-03 | 3.13E-03 | ND | ND | ND | ND | ND | ND | ND |
| Methylene Chloride | 3.73E-01 | 5.21E-02 | 1.76E-07 | 2.06E-04 | 8.00E-05 | 8.117E-09 | 4.00E-05 | ND | ND |
| tert-Butyl Alcohol | 3.03E-03 | 3.03E-03 | ND | ND | ND | ND | ND | ND | ND |
| Acrylonitrile | 2.60E-02 | 2.17E-03 | 1.40E-08 | 1.63E-05 | 6.36E-06 | 6.451E-10 | 3.18E-06 | ND | ND |
| trans-1,2-Dichloroethene | 3.96E-03 | 3.96E-03 | ND | ND | ND | ND | ND | ND | ND |
| Methyl t-Butyl Ether | 3.61E-03 | 3.61E-03 | ND | ND | ND | ND | ND | ND | ND |
| Hexane | 6.93E-01 | 5.29E-02 | 3.49E-07 | 4.07E-04 | 1.59E-04 | 1.609E-08 | 7.92E-05 | ND | ND |
| 1,1-Dichloroethane | 3.97E-03 | 3.97E-03 | ND | ND | ND | ND | ND | ND | ND |
| Vinyl Acetate | 3.52E-03 | 3.52E-03 | ND | ND | ND | ND | ND | ND | ND |
| cis-1,2-Dichloroethene | 3.96E-03 | 3.96E-03 | ND | ND | ND | ND | ND | ND | ND |
| 2-Butanone | 2.95E-03 | 2.95E-03 | ND | ND | ND | ND | ND | ND | ND |
| Ethyl Acetate | 1.44E-02 | 3.60E-03 | 7.76E-09 | 9.04E-06 | 3.52E-06 | 3.571E-10 | 1.76E-06 | ND | ND |

Table B-1: Air Modeling Output Data

| Cartridge, 5.56mm Bsl Practice, M862 (M16A1) | | | | | | | | | |
|--|---------------------------------------|---|--|--|----------|--|---|--|--|
| DODIC: A065 | | | | | | | | | |
| Number of Items tested = | | | | 30 | | Release duration (t): | | 1 round | |
| Net Explosive Weight (lbs) = | | | | 8.58E-04 | | Unit Concentration (UC): | | 2.030E-04 (g/m³)/(g/s) | |
| Compound | ATC Firing Test Results | | | | | Total Mass of Substance Emitted (grams/item) | Average Modeled Concentration for One Item (grams/m³) | Pollutant Emission Rate for One Item (g/sec) | |
| | Measured Actual Concentration (mg/m³) | Measured Background Concentration (mg/m³) | Average Adjusted Emission Factor (lb/item) | Average Adjusted Emission Factor (lb/lb NEW) | M | | | | |
| o-Xylene | 1.74E-03 | 4.34E-03 | 2.36E-09 | 2.75E-06 | 1.07E-06 | 1.086E-10 | 5.35E-07 | | |
| Styrene | 2.56E-03 | 4.26E-03 | 2.32E-09 | 2.70E-06 | 1.05E-06 | 1.066E-10 | 5.25E-07 | | |
| Bromoform | 1.03E-02 | 1.03E-02 | ND | ND | ND | ND | ND | | |
| Cumene | 4.92E-03 | 4.92E-03 | ND | ND | ND | ND | ND | | |
| 1,1,2,2-Tetrachlorethane | 6.87E-03 | 6.87E-03 | ND | ND | ND | ND | ND | | |
| 1,2,3-Trichloropropane | 6.03E-03 | 6.03E-03 | ND | ND | ND | ND | ND | | |
| Bromobenzene | 6.42E-03 | 6.42E-03 | ND | ND | ND | ND | ND | | |
| 4-Ethyltoluene | 4.92E-03 | 4.92E-03 | ND | ND | ND | ND | ND | | |
| 1,3,5-Trimethylbenzene | 4.92E-03 | 4.92E-03 | ND | ND | ND | ND | ND | | |
| Alpha Methyl Styrene | 4.83E-03 | 4.83E-03 | ND | ND | ND | ND | ND | | |
| 1,2,4-Trimethylbenzene | 1.47E-03 | 4.92E-03 | 7.91E-10 | 9.22E-07 | 3.59E-07 | 3.642E-11 | 1.79E-07 | | |
| 1,3-Dichlorobenzene | 6.01E-03 | 6.01E-03 | ND | ND | ND | ND | ND | | |
| 1,4-Dichlorobenzene | 6.01E-03 | 6.01E-03 | ND | ND | ND | ND | ND | | |
| Benzyl Chloride | 5.18E-03 | 5.18E-03 | ND | ND | ND | ND | ND | | |
| 1,2-Dichlorobenzene | 6.01E-03 | 6.01E-03 | ND | ND | ND | ND | ND | | |
| Hexachlorethane | 9.68E-03 | 9.68E-03 | ND | ND | ND | ND | ND | | |
| 1,2,4-Trichlorobenzene | 7.42E-03 | 7.42E-03 | ND | ND | ND | ND | ND | | |
| Hexachlorobutadiene | 1.07E-02 | 1.07E-02 | ND | ND | ND | ND | ND | | |
| VOC Tentatively Identified Compounds (TICs) | | | | | | | | | |
| Hydrocarbons | | | | | | | | | |
| Methane | 5.35E+00 | 1.36E+00 | 2.21E-06 | 2.58E-03 | 1.00E-03 | 1.018E-07 | 5.01E-04 | | |
| Ethylene | 1.26E+00 | 2.29E-02 | 6.76E-07 | 7.88E-04 | 3.07E-04 | 3.111E-08 | 1.53E-04 | | |
| Acetylene | 1.30E+00 | 2.13E-02 | 7.02E-07 | 8.18E-04 | 3.18E-04 | 3.231E-08 | 1.59E-04 | | |
| Ethane | 7.44E-02 | 2.46E-02 | 4.00E-08 | 4.67E-05 | 1.82E-05 | 1.843E-09 | 9.08E-06 | | |
| Propylene | 1.02E-01 | 3.44E-02 | 5.46E-08 | 6.37E-05 | 2.48E-05 | 2.515E-09 | 1.24E-05 | | |
| Propane | 3.61E-02 | 3.61E-02 | ND | ND | ND | ND | ND | | |
| Propyne | 5.12E-02 | 3.20E-02 | 2.75E-08 | 3.21E-05 | 1.25E-05 | 1.267E-09 | 6.24E-06 | | |
| Isobutane | 4.75E-02 | 4.75E-02 | ND | ND | ND | ND | ND | | |
| 1-Butene/Isobutylene | 4.59E-02 | 4.59E-02 | ND | ND | ND | ND | ND | | |

Table B-1: Air Modeling Output Data

| Cartridge, 5.56mm Bsl Practice, M862 (M16A1) | | | | | Number of Rounds (I): | | 1 round |
|--|---------------------------------------|---|--|--|--|---|--|
| DODIC: A065 | | | | | Release duration (I): | | 2 seconds |
| Number of Items tested = 30 | | | | | Unit Concentration (UC): | | 2.030E-04 (g/m³)/(g/s) |
| Net Explosive Weight (lbs) = 8.58E-04 | | | | | | | |
| Compound | ATC Firing Test Results | | | | | | |
| | Measured Actual Concentration (mg/m³) | Measured Background Concentration (mg/m³) | Average Adjusted Emission Factor (lb/item) | Average Adjusted Emission Factor (lb/lb NEW) | Total Mass of Substance Emitted (grams/item) | Average Modeled Concentration for One Item (grams/m³) | Pollutant Emission Rate for One Item (g/sec) |
| 1,3-Butadiene/butane | 6.88E-02 | 6.88E-02 | ND | ND | ND | ND | ND |
| cis-butene | 4.59E-02 | 4.59E-02 | ND | ND | ND | ND | ND |
| 1-Butyne | 4.59E-02 | 4.59E-02 | ND | ND | ND | ND | ND |
| trans-Butene | 4.59E-02 | 4.59E-02 | ND | ND | ND | ND | ND |
| 2-Butyne | 4.42E-02 | 4.42E-02 | ND | ND | ND | ND | ND |
| n-Pentane | 5.90E-02 | 5.90E-02 | ND | ND | ND | ND | ND |
| n-Hexane | 7.05E-02 | 7.05E-02 | ND | ND | ND | ND | ND |
| SVOCs | | | | | | | |
| N-nitrosodimethylamine | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| Bis(2-chloroethyl)ether | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| Phenol | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| 2-chlorophenol | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| 1,3-dichlorobenzene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| 1,4-dichlorobenzene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| 1,2-dichlorobenzene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| Benzyl alcohol | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| Bis(2-chloroisopropyl)ether | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| 2-methylphenol | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| Hexachloroethane | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| N-nitroso-di-n-propylamine | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| 4-methylphenol | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| Nitrobenzene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| Isophorone | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| 2-nitrophenol | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| 2,4-dimethylphenol | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| Bis(2-chloroethoxy)methane | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| 2,4-dichlorophenol | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| 1,2,4-trichlorobenzene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND |
| Naphthalene | 1.34E-02 | 1.84E-02 | 7.21E-09 | 8.40E-06 | 3.27E-06 | 3.317E-10 | 1.63E-06 |

Table B-1: Air Modeling Output Data

| Compound | Cartridge, 5.56mm Bsl Practice, M862 (M16A1) | | | | Number of Rounds (l): | | 1 | round |
|----------------------------|--|--|--|--|--|--|--|---------|
| | DODIC: A065 | | | | Release duration (t): | | 2 | seconds |
| | Number of Items tested = 30 | | | | Unit Concentration (UC): | | 2.030E-04 (g/m ³)/(g/s) | |
| | Net Explosive Weight (lbs) = 8.58E-04 | | | | | | | |
| | ATC Firing Test Results | | | | | | | |
| | Measured Actual Concentration (mg/m ³) | Measured Background Concentration (mg/m ³) | Average Adjusted Emission Factor (lb/item) | Average Adjusted Emission Factor (lb/lb NEW) | Total Mass of Substance Emitted (grams/item) | Average Modeled Concentration for One Item (grams/m ³) | Pollutant Emission Rate for One Item (g/sec) | |
| 4-chloroaniline | 1.81E-02 | 1.84E-02 | ND | ND | M | CONC | ER ₁ | |
| Hexachlorobutadiene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| 4-chloro-3-methylphenol | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| 2-methylnaphthalene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| Hexachlorocyclopentadiene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| 2,4,6-trichlorophenol | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| 2,4,5-trichlorophenol | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| 2-chloronaphthalene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| 2-nitroaniline | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| Acenaphthylene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| Dimethylphthalate | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| 2,6-dinitrotoluene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| Acenaphthene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| 3-nitroaniline | 3.63E-02 | 3.68E-02 | ND | ND | ND | ND | ND | |
| 2,4-dinitrophenol | 3.63E-02 | 3.68E-02 | ND | ND | ND | ND | ND | |
| Dibenzofuran | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| 2,4-dinitrotoluene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| 4-nitrophenol | 3.63E-02 | 3.68E-02 | ND | ND | ND | ND | ND | |
| Fluorene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| 4-chlorophenyl-phenylether | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| Diethylphthalate | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| 4-nitroaniline | 3.63E-02 | 3.68E-02 | ND | ND | ND | ND | ND | |
| 4,6-dinitro-2-methylphenol | 3.63E-02 | 3.68E-02 | ND | ND | ND | ND | ND | |
| N-nitrosodiphenylamine(1) | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| 4-bromophenyl-phenylether | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| Hexachlorobenzene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| Pentachlorophenol | 3.63E-02 | 3.68E-02 | ND | ND | ND | ND | ND | |
| Phenanthrene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |
| Anthracene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | |

Table B-1: Air Modeling Output Data

| Cartridge, 5.56mm Bsl Practice, M862 (M16A1) | | | | | | | | | |
|--|--|---|--|--|----------|--|---|---|--|
| DODIC: A065 | | | | | | | | | |
| Number of Items tested = 30 | | | | | | | | | |
| Net Explosive Weight (lbs) = 8.58E-04 | | | | | | | | | |
| Compound | ATC Firing Test Results | | | | | Total Mass of Substance Emitted (grams/item) | Average Modeled Concentration for One Item (grams/m ³) | Pollutant Emission Rate for One Item (g/sec) | |
| | Measured Actual Concentration (mg/m ³) | Measured Background Concentration (mg/m ³) | Average Adjusted Emission Factor (lb/item) | Average Adjusted Emission Factor (lb/lb NEW) | M | | | | |
| Di-n-butylphthalate | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | ND | |
| Fluoranthene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | ND | |
| Pyrene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | ND | |
| Butylbenzylphthalate | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | ND | |
| Benzo(a)anthracene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | ND | |
| Chrysene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | ND | |
| 3,3-dichlorobenzidine | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | ND | |
| Bis(2-ethylhexyl)phthalate | 4.18E-02 | 4.41E-02 | 9.19E-10 | 1.07E-06 | 4.17E-07 | 4.233E-11 | 2.09E-07 | ND | |
| Di-n-octylphthalate | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | ND | |
| Benzo(b)fluoranthene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | ND | |
| Benzo(k)fluoranthene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | ND | |
| Benzo(a)pyrene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | ND | |
| Indeno(1,2,3-cd)pyrene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | ND | |
| Dibenz(a,h)anthracene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | ND | |
| Benzo(g,h,i)perylene | 1.81E-02 | 1.84E-02 | ND | ND | ND | ND | ND | ND | |
| SVOC Tentatively Identified Compounds (TICs) | | | | | | | | | |
| TO-13 (PAHs) | | | | | | | | | |
| Naphthalene | 1.23E-02 | 1.05E-03 | 6.10E-09 | 7.12E-06 | 2.77E-06 | 2.810E-10 | 1.38E-06 | | |
| Acenaphthylene | 8.61E-04 | 1.81E-05 | 4.63E-10 | 5.39E-07 | 2.10E-07 | 2.130E-11 | 1.05E-07 | | |
| Acenaphthene | 4.44E-05 | 1.81E-05 | 2.39E-11 | 2.79E-08 | 1.08E-08 | 1.100E-12 | 5.42E-09 | | |
| Fluorene | 1.05E-04 | 1.81E-05 | 5.65E-11 | 6.59E-08 | 2.56E-08 | 2.603E-12 | 1.28E-08 | | |
| Phenanthrene | 2.63E-04 | 4.69E-05 | 1.18E-10 | 1.38E-07 | 5.36E-08 | 5.440E-12 | 2.68E-08 | | |
| Anthracene | 2.36E-05 | 1.81E-05 | 1.27E-11 | 1.48E-08 | 5.75E-09 | 5.837E-13 | 2.88E-09 | | |
| Fluoranthene | 7.44E-04 | 2.17E-05 | 3.89E-10 | 4.54E-07 | 1.77E-07 | 1.793E-11 | 8.83E-08 | | |
| Pyrene | 2.27E-03 | 3.43E-05 | 1.20E-09 | 1.40E-06 | 5.46E-07 | 5.538E-11 | 2.73E-07 | | |
| Benzo(a)anthracene | 1.44E-04 | 1.81E-05 | 7.75E-11 | 9.04E-08 | 3.52E-08 | 3.568E-12 | 1.76E-08 | | |
| Chrysene | 1.78E-04 | 1.81E-05 | 9.55E-11 | 1.11E-07 | 4.33E-08 | 4.397E-12 | 2.17E-08 | | |
| Benzo(b)fluoranthene | 2.90E-04 | 2.17E-05 | 1.45E-10 | 1.69E-07 | 6.58E-08 | 6.683E-12 | 3.29E-08 | | |
| Benzo(k)fluoranthene | 1.72E-04 | 1.81E-05 | 9.25E-11 | 1.08E-07 | 4.20E-08 | 4.260E-12 | 2.10E-08 | | |

Table B-1: Air Modeling Output Data

| Cartridge, 5.56mm Bsl Practice, M862 (M16A1) | | | | | Number of Rounds (I): | | 1 round | | | | |
|--|--|---|--|--|--|---|--|----------|----------|-----------|----------|
| DODIC: A065 | | | | | Release duration (I): | | 2 seconds | | | | |
| Number of Items tested = 30 | | | | | Unit Concentration (UC): | | 2.030E-04 (g/m ³)/(g/s) | | | | |
| Net Explosive Weight (lbs) = 8.58E-04 | | | | | | | | | | | |
| Compound | ATC Firing Test Results ¹ | | | | Total Mass of Substance Emitted (grams/item) | Average Modeled Concentration for One Item (grams/m ³) | Pollutant Emission Rate for One Item (g/sec) ER _i | | | | |
| | Measured Actual Concentration (mg/m ³) | Measured Background Concentration (mg/m ³) | Average Adjusted Emission Factor (lb/item) | Average Adjusted Emission Factor (lb/lb NEW) | | | | | | | |
| | Benzo(e)pyrene | 6.53E-04 | 1.81E-05 | 3.51E-10 | | | | 4.09E-07 | 1.59E-07 | 1.614E-11 | 7.95E-08 |
| | Benzo(a)pyrene | 5.71E-04 | 1.81E-05 | 3.07E-10 | | | | 3.58E-07 | 1.39E-07 | 1.412E-11 | 6.95E-08 |
| | Indeno(1,2,3-cd)pyrene | 8.34E-04 | 1.81E-05 | 4.49E-10 | | | | 5.23E-07 | 2.03E-07 | 2.065E-11 | 1.02E-07 |
| | Dibenz(a,h)anthracene | 1.81E-05 | 1.81E-05 | ND | | | | ND | ND | ND | ND |
| | Benzo(g,h,i)perylene | 2.27E-03 | 1.81E-05 | 1.22E-09 | | | | 1.42E-06 | 5.53E-07 | 5.609E-11 | 2.76E-07 |
| | Dioxins and Furans | | | | | | | | | | |
| | 2378-Tetrachlorodibenzo-p-dioxin | 4.52E-09 | 4.96E-09 | ND | | | | ND | ND | ND | ND |
| | 12378-Pentachlorodibenzo-p-dioxin | 3.11E-09 | 3.55E-09 | ND | | | | ND | ND | ND | ND |
| 123478-Hexachlorodibenzo-p-dioxin | 2.15E-09 | 2.51E-09 | ND | ND | ND | ND | ND | | | | |
| 123678-Hexachlorodibenzo-p-dioxin | 2.25E-09 | 2.51E-09 | ND | ND | ND | ND | ND | | | | |
| 123789-Hexachlorodibenzo-p-dioxin | 7.06E-09 | 8.06E-09 | ND | ND | ND | ND | ND | | | | |
| 1234678-Heptachlorodibenzo-p-dioxin | 5.91E-09 | 4.17E-09 | 1.13E-15 | 1.32E-12 | 5.15E-13 | 5.224E-17 | 2.57E-13 | | | | |
| OCDD | 7.51E-08 | 4.10E-08 | 2.03E-14 | 2.36E-11 | 9.20E-12 | 9.334E-16 | 4.60E-12 | | | | |
| 2378-Tetrachlorodibenzo-p-furan | 2.90E-09 | 3.33E-09 | ND | ND | ND | ND | ND | | | | |
| 12378-Pentachlorodibenzo-p-furan | 4.34E-09 | 4.89E-09 | ND | ND | ND | ND | ND | | | | |
| 23478-Pentachlorodibenzo-o-furan | 3.16E-09 | 3.64E-09 | ND | ND | ND | ND | ND | | | | |
| 123478-Hexachlorodibenzo-p-furan | 2.54E-09 | 2.84E-09 | ND | ND | ND | ND | ND | | | | |
| 123678-Hexachlorodibenzo-p-furan | 2.57E-09 | 2.95E-09 | ND | ND | ND | ND | ND | | | | |
| 123789-Hexachlorodibenzo-p-furan | 2.64E-09 | 2.78E-09 | ND | ND | ND | ND | ND | | | | |
| 234678-Hexachlorodibenzo-p-furan | 1.31E-09 | 1.56E-09 | ND | ND | ND | ND | ND | | | | |
| 1234678-Heptachlorodibenzo-p-furan | 1.64E-09 | 1.51E-09 | ND | ND | ND | ND | ND | | | | |
| 1234789-Heptachlorodibenzo-p-furan | 8.09E-10 | 8.10E-10 | ND | ND | ND | ND | ND | | | | |
| OCDF | 3.52E-09 | 2.61E-09 | 6.10E-16 | 7.11E-13 | 2.77E-13 | 2.808E-17 | 1.38E-13 | | | | |
| Energetics | | | | | | | | | | | |
| Nitrobenzene | 3.49E-03 | NA | ND | ND | ND | ND | ND | | | | |
| 2-Nitrotoluene | 3.49E-03 | NA | ND | ND | ND | ND | ND | | | | |
| 3-Nitrotoluene | 3.49E-03 | NA | ND | ND | ND | ND | ND | | | | |
| 4-Nitrotoluene | 3.49E-03 | NA | ND | ND | ND | ND | ND | | | | |
| Nitroglycerine | 3.49E-03 | NA | ND | ND | ND | ND | ND | | | | |

Table B-1: Air Modeling Output Data

| Cartridge, 5.56mm Bsl Practice, M862 (M16A1) | | | | | | | | | |
|--|--|---|--|--|----|--|---|---|--|
| DODIC: A065 | | | | | | | | | |
| Number of Items tested = 30 | | | | | | | | | |
| Net Explosive Weight (lbs) = 8.58E-04 | | | | | | | | | |
| Compound | ATC Firing Test Results ¹ | | | | | Total Mass of Substance Emitted (grams/item) | Average Modeled Concentration for One Item (grams/m ³) | Pollutant Emission Rate for One Item (g/sec) | Number of Rounds (I): Release duration (I): Unit Concentration (UC): |
| | Measured Actual Concentration (mg/m ³) | Measured Background Concentration (mg/m ³) | Average Adjusted Emission Factor (lb/item) | Average Adjusted Emission Factor (lb/lb NEW) | | | | | 1 round 2 seconds 2.030E-04 (g/m ³)/(g/s) |
| 1,3-Dinitrobenzene | 3.49E-03 | NA | ND | ND | M | CONC | ER ₁ | ND | |
| 2,6-Dinitrotoluene | 3.49E-03 | NA | ND | ND | ND | ND | ND | ND | |
| 2,4-Dinitrotoluene | 3.49E-03 | NA | ND | ND | ND | ND | ND | ND | |
| 1,3,5-Trinitrobenzene | 3.49E-03 | NA | ND | ND | ND | ND | ND | ND | |
| 2,4,6-Trinitrotoluene | 3.49E-03 | NA | ND | ND | ND | ND | ND | ND | |
| RDX | 3.49E-03 | NA | ND | ND | ND | ND | ND | ND | |
| 4-Amino-2,6-Dinitrotoluene | 3.49E-03 | NA | ND | ND | ND | ND | ND | ND | |
| 2-Amino-4,6-Dinitrotoluene | 3.49E-03 | NA | ND | ND | ND | ND | ND | ND | |
| Tetryl | 3.49E-03 | NA | ND | ND | ND | ND | ND | ND | |
| HMX | 6.98E-03 | NA | ND | ND | ND | ND | ND | ND | |
| Pentaerythritol tetranitrate | 6.98E-03 | NA | ND | ND | ND | ND | ND | ND | |
| Dibutyl phthalate | 1.75E-01 | NA | ND | ND | ND | ND | ND | ND | |
| Diethyl phthalate | 1.75E-01 | NA | ND | ND | ND | ND | ND | ND | |
| Diphenylamine | 8.73E-02 | NA | ND | ND | ND | ND | ND | ND | |
| Footnotes: | | | | | | | | | |
| ¹ ATC = Aberdeen Test Center (for additional information on the data, refer to the Firing Point Emission Study) | | | | | | | | | |
| NA = Not Applicable | | | | | | | | | |
| ND = Not Detected | | | | | | | | | |

APPENDIX C

**HEALTH-BASED SCREENING LEVELS AND ACUTE
TOXICITY VALUES**

Appendix C: Health-Based Screening Levels and Acute Toxicity Values

| Compound | CAS # | Region 9 PRG ($\mu\text{g}/\text{m}^3$) | Toxicity Endpoint (c or nc) | Region 3 RBC ($\mu\text{g}/\text{m}^3$) | Toxicity Endpoint (c or nc) | HBSL ($\mu\text{g}/\text{m}^3$) | ERPG ($\mu\text{g}/\text{m}^3$) | TEEL ($\mu\text{g}/\text{m}^3$) | AEGL ($\mu\text{g}/\text{m}^3$) | Source (T or E) | ATV ($\mu\text{g}/\text{m}^3$) |
|----------------------------------|------------|---|-----------------------------------|---|-----------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------|-------------------------------------|
| Permanent Gases | | | | | | | | | | | |
| Ammonia (NH_3) | 7664-41-7 | 1.04E+02 | nc | 104.39 | nc | 1.04E+02 | ##### | 1.75E+04 | NA | E | 1.75E+04 |
| Carbon Dioxide (CO_2) | 124-38-9 | NA | | NA | | NA | NA | 5.40E+07 | NA | T | 5.40E+07 |
| Carbon Monoxide (CO) | 630-08-0 | 1.00E+04 | nc | NA | nc | 1.00E+04 | ##### | 2.28E+05 | NA | E | 2.30E+05 |
| Oxides of Nitrogen (as NO) | 10102-43-9 | 1.00E+02 | nc | NA | nc | 1.00E+02 | NA | 3.08E+04 | NA | T | 3.08E+04 |
| Sulfur Dioxide (SO_2) | 7446-09-5 | 8.00E+01 | nc | NA | nc | 8.00E+01 | ##### | 7.86E+02 | NA | E | 7.89E+02 |
| Acid Gases | | | | | | | | | | | |
| Hydrogen fluoride | 7664-39-3 | NA | | NA | | NA | ##### | 1.64E+03 | NA | E | 1.60E+03 |
| Hydrogen chloride | 7647-01-0 | 2.08E+01 | nc | 2.08E+01 | nc | 2.08E+01 | ##### | 4.47E+03 | NA | E | 4.50E+03 |
| Hydrogen bromide | 10035-10-6 | NA | | NA | | NA | NA | 9.93E+03 | NA | T | 9.93E+03 |
| Nitric Acid | 7697-37-2 | NA | | NA | | NA | NA | 2.58E+03 | ##### | A | 1.30E+03 |
| Phosphoric acid | 7664-38-2 | 1.04E+01 | nc | 1.06E+01 | nc | 1.04E+01 | NA | 3.00E+03 | NA | T | 3.00E+03 |
| Sulfuric Acid | 7664-93-9 | NA | | NA | | NA | ##### | 2.00E+03 | NA | E | 2.00E+03 |
| Cyanide | | | | | | | | | | | |
| Particulate Cyanide | 57-12-5 | NA | | 7.30E+01 | | 7.30E+01 | NA | 5.00E+03 | NA | T | 5.00E+03 |
| Hydrogen Cyanide | 74-90-8 | 3.13E+00 | nc | 3.14E+00 | nc | 3.13E+00 | NA | 5.17E+03 | NA | T | 5.17E+03 |
| Particulates | | | | | | | | | | | |
| Total Suspended Particulate | 12789-66-1 | 5.00E+01 | nc | NA | nc | 5.00E+01 | NA | NA | NA | | NA |
| PM_{10} | | 5.00E+01 | nc | NA | nc | 5.00E+01 | NA | NA | NA | | NA |
| $\text{PM}_{2.5}$ | | 1.50E+01 | nc | NA | nc | 1.50E+01 | NA | NA | NA | | NA |
| Metals | | | | | | | | | | | |
| Aluminum | 7429-90-5 | 5.11E+00 | nc | 3.65E+00 | nc | 5.11E+00 | NA | 3.00E+04 | NA | T | 3.00E+04 |
| Antimony | 7440-36-0 | NA | | 1.46E+00 | | 1.46E+00 | NA | 1.50E+03 | NA | T | 1.50E+03 |
| Arsenic | 7440-38-2 | 4.47E-04 | c | 4.15E-04 | c | 4.47E-04 | NA | 3.00E+01 | NA | T | 3.00E+01 |
| Barium | 7440-39-3 | 5.21E-01 | nc | 5.11E-01 | nc | 5.21E-01 | NA | 1.50E+03 | NA | T | 1.50E+03 |
| Beryllium | 7440-41-7 | 8.00E-04 | c | 7.45E-04 | c | 8.00E-04 | NA | 5.00E+00 | NA | T | 5.00E+00 |
| Cadmium | 7440-43-9 | 1.07E-03 | c | 9.94E-04 | c | 1.07E-03 | NA | 3.00E+01 | NA | T | 3.00E+01 |
| Calcium | 7440-70-2 | NA | | NA | | NA | NA | 3.00E+04 | NA | T | 3.00E+04 |
| Chromium | 7440-47-3 | | c | 1.53E-04 | c | 1.53E-04 | NA | 1.50E+03 | NA | T | 1.50E+03 |
| Cobalt | 7440-48-4 | NA | | 2.20E+02 | | 2.20E+02 | NA | 6.00E+01 | NA | T | 6.00E+01 |
| Copper | 7440-50-8 | NA | | 1.46E+02 | | 1.46E+02 | NA | 3.00E+03 | NA | T | 3.00E+03 |
| Lead | 7439-92-1 | 1.50E+00 | nc | NA | nc | 1.50E+00 | NA | 1.50E+02 | NA | T | 1.50E+02 |
| Magnesium | 7439-95-4 | NA | | NA | | NA | NA | 3.00E+04 | NA | T | 3.00E+04 |
| Manganese | 7439-96-5 | 5.11E-02 | nc | 5.22E-02 | nc | 5.11E-02 | NA | 3.00E+03 | NA | T | 3.00E+03 |
| Nickel | 7440-02-0 | NA | | 7.30E+01 | | 7.30E+01 | NA | 3.00E+03 | NA | T | 3.00E+03 |
| Selenium | 7782-49-2 | NA | | 1.83E+01 | | 1.83E+01 | NA | 6.00E+02 | NA | T | 6.00E+02 |

Appendix C: Health-Based Screening Levels and Acute Toxicity Values

| Compound | CAS # | Region 9 PRG (µg/m ³) | Toxicity Endpoint (c or nc) | Region 3 RBC (µg/m ³) | Toxicity Endpoint (c or nc) | HBSL (µg/m ³) | ERPG (µg/m ³) | TEEL (µg/m ³) | AEGL (µg/m ³) | Source (T or E) | ATV (µg/m ³) |
|--------------------------|-----------|---|-----------------------------------|---|-----------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|--------------------|-----------------------------|
| Silver | 7740-22-4 | NA | | 1.83E+01 | nc | 1.83E+01 | NA | 3.00E+02 | NA | T | 3.00E+02 |
| Thallium | 7440-28-0 | NA | | 2.56E-01 | nc | 2.56E-01 | NA | 3.00E+02 | NA | T | 3.00E+02 |
| Vanadium | 7440-62-2 | NA | | 2.56E+01 | nc | 2.56E+01 | NA | 1.50E+02 | NA | T | 1.50E+02 |
| Zinc | 7440-66-6 | NA | | 1.10E+03 | nc | 1.10E+03 | NA | 3.00E+04 | NA | T | 3.00E+04 |
| TO-11 Carbonyls | | | | | | | | | | | |
| Formaldehyde | 50-00-0 | 1.48E-01 | c | 1.39E-01 | c | 1.48E-01 | ##### | 1.23E+03 | NA | E | 1.23E+03 |
| Acetaldehyde | 75-07-0 | 8.73E-01 | c | 8.13E-01 | c | 8.73E-01 | ##### | 1.80E+04 | NA | E | 1.80E+04 |
| Acetone | 67-64-1 | 3.65E+02 | nc | 3.65E+02 | nc | 3.65E+02 | NA | 2.37E+06 | NA | T | 2.37E+06 |
| Acrolein | 107-02-8 | 2.09E-02 | nc | 2.08E-02 | nc | 2.09E-02 | ##### | 2.29E+02 | NA | E | 2.30E+02 |
| Propionaldehyde | 123-38-6 | NA | | NA | | NA | NA | 7.50E+04 | NA | T | 7.50E+04 |
| Crotonaldehyde | 4170-30-3 | 3.54E-03 | c | 3.30E-03 | c | 3.54E-03 | ##### | 5.72E+03 | NA | E | 5.72E+03 |
| Butyraldehyde | 123-72-8 | NA | | NA | | NA | NA | 7.38E+04 | NA | T | 7.38E+04 |
| Benzaldehyde | 100-52-7 | 3.65E+02 | nc | 3.65E+02 | nc | 3.65E+02 | NA | 1.50E+04 | NA | T | 1.50E+04 |
| Isovaleraldehyde | 590-86-3 | NA | | NA | | NA | NA | NA | NA | | NA |
| Valeraldehyde | 110-62-3 | NA | | NA | | NA | NA | NA | NA | | NA |
| o,m,p-Tolualdehyde | 1334-78-7 | NA | | NA | | NA | NA | NA | NA | | NA |
| Hexaldehyde | 66-25-1 | NA | | NA | | NA | NA | NA | NA | | NA |
| 2,5-Dimethylbenzaldehyde | 5779-94-2 | NA | | NA | | NA | NA | NA | NA | | NA |
| VOCs | | | | | | | | | | | |
| Propene | 115-07-1 | NA | | NA | | NA | NA | NA | NA | | NA |
| Dichlorodifluoromethane | 75-71-8 | 2.09E+02 | nc | 1.83E+02 | nc | 2.09E+02 | NA | 1.48E+07 | NA | T | 1.48E+07 |
| Chlorodifluoromethane | 75-45-6 | 5.11E+04 | nc | 5.11E+04 | nc | 5.11E+04 | NA | 4.41E+06 | NA | T | 4.41E+06 |
| Freon 114 | 76-14-2 | NA | | NA | | NA | NA | 2.10E+07 | NA | T | 2.10E+07 |
| Chloromethane | 74-87-3 | 1.07E+00 | c | 1.79E+00 | c | 1.07E+00 | NA | 2.06E+05 | NA | T | 2.06E+05 |
| Vinyl Chloride | 75-01-4 | 2.20E-02 | c | 2.10E-02 | c | 2.20E-02 | NA | 1.28E+04 | NA | T | 1.28E+04 |
| 1,3-Butadiene | 106-99-0 | 3.74E-03 | c | 3.48E-03 | c | 3.74E-03 | ##### | 2.21E+04 | NA | E | 2.20E+04 |
| Bromomethane | 74-83-9 | 5.21E+00 | nc | 5.11E+00 | nc | 5.21E+00 | NA | 5.82E+04 | NA | T | 5.82E+04 |
| Chloroethane | 75-00-3 | 2.32E+00 | nc | NA | nc | 2.32E+00 | NA | 2.64E+06 | NA | T | 2.64E+06 |
| Dichlorofluoromethane | 75-71-8 | 2.09E+02 | nc | 1.83E+02 | nc | 2.09E+02 | NA | 1.48E+07 | NA | T | 1.48E+07 |
| Trichlorofluoromethane | 75-69-4 | 7.30E+02 | nc | 7.30E+02 | nc | 7.30E+02 | NA | 2.81E+06 | NA | T | 2.81E+06 |
| Pentane | 109-66-0 | NA | | NA | | NA | NA | 1.80E+06 | NA | T | 1.80E+06 |
| Acrolein | 107-02-8 | 2.09E-02 | nc | 2.08E-02 | nc | 2.09E-02 | ##### | 2.29E+02 | NA | E | 2.30E+02 |
| 1,1-Dichloroethene | 75-35-4 | 5.21E+02 | nc | 5.11E+02 | nc | 5.21E+02 | NA | 7.92E+04 | NA | T | 7.92E+04 |
| Freon 113 | 76-13-1 | 3.13E+04 | nc | 3.14E+04 | nc | 3.13E+04 | NA | 9.58E+06 | NA | T | 9.58E+06 |
| Acetone | 67-64-1 | 3.65E+02 | nc | 3.65E+02 | nc | 3.65E+02 | NA | 2.37E+06 | NA | T | 2.37E+06 |
| Methyl Iodide | 74-88-4 | NA | | NA | | NA | 145000 | 1.45E+05 | NA | E | 1.45E+05 |
| Carbon Disulfide | 75-15-0 | 7.30E+02 | nc | 7.30E+02 | nc | 7.30E+02 | NA | 3.11E+04 | NA | T | 3.11E+04 |

Appendix C: Health-Based Screening Levels and Acute Toxicity Values

| Compound | CAS # | Region 9 PRG ($\mu\text{g}/\text{m}^3$) | Toxicity Endpoint (c or nc) | Region 3 RBC ($\mu\text{g}/\text{m}^3$) | Toxicity Endpoint (c or nc) | HBSL ($\mu\text{g}/\text{m}^3$) | ERPG ($\mu\text{g}/\text{m}^3$) | TEEL ($\mu\text{g}/\text{m}^3$) | AEGL ($\mu\text{g}/\text{m}^3$) | Source (T or E) | ATV ($\mu\text{g}/\text{m}^3$) |
|------------------------------------|------------|---|-----------------------------------|---|-----------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------|-------------------------------------|
| Acetonitrile | 75-05-8 | 6.20E+01 | nc | 6.21E+01 | nc | 6.20E+01 | NA | 1.01E+05 | | T | 1.01E+05 |
| 3-Chloropropene | 107-05-1 | 1.04E+00 | nc | NA | | 1.04E+00 | ##### | 9.39E+03 | | E | 9.39E+03 |
| Methylene Chloride | 75-09-2 | 4.09E+00 | c | 3.79E+00 | c | 4.09E+00 | 696000 | 6.94E+05 | | E | 6.96E+05 |
| tert-Butyl Alcohol | 75-65-0 | NA | | NA | | NA | NA | 4.55E+05 | | T | 4.55E+05 |
| Acrylonitrile | 107-13-1 | 2.83E-02 | c | 2.61E-02 | c | 2.83E-02 | 21700 | 2.17E+04 | | E | 2.17E+04 |
| trans-1,2-Dichloroethene | 156-60-5 | 7.30E+01 | nc | 7.30E+01 | nc | 7.30E+01 | NA | 4.95E+04 | | T | 4.95E+04 |
| Methyl t-Butyl Ether | 1634-04-4 | 3.13E+03 | nc | 3.13E+03 | nc | 3.13E+03 | NA | 4.32E+05 | | T | 4.32E+05 |
| Hexane | 110-54-3 | 2.09E+02 | nc | 2.08E+02 | nc | 2.09E+02 | NA | 5.28E+05 | | T | 5.28E+05 |
| 1,1-Dichloroethane | 75-34-3 | 5.21E+02 | nc | 5.11E+02 | nc | 5.21E+02 | NA | 1.21E+06 | | T | 1.21E+06 |
| Vinyl Acetate | 108-05-4 | 2.09E+02 | nc | 2.08E+02 | nc | 2.09E+02 | 19150 | 1.76E+04 | | E | 1.92E+04 |
| cis-1,2-Dichloroethene | 156-59-2 | 3.65E+01 | nc | 3.65E+01 | nc | 3.65E+01 | NA | 7.92E+05 | | T | 7.92E+05 |
| 2-Butanone | 78-93-3 | 1.04E+03 | nc | 1.04E+03 | nc | 1.04E+03 | NA | 8.85E+05 | | T | 8.85E+05 |
| Ethyl Acetate | 141-78-6 | 3.29E+03 | nc | 3.29E+03 | nc | 3.29E+03 | NA | 1.44E+06 | | T | 1.44E+06 |
| Methyl Acrylate | 96-33-3 | 1.10E+02 | nc | 1.10E+02 | nc | 1.10E+02 | NA | NA | | | NA |
| Chloroform | 67-66-3 | 8.35E-02 | c | 7.73E-02 | c | 8.35E-02 | NA | 9.76E+03 | | T | 9.76E+03 |
| 1,1,1-Trichloroethane | 71-55-6 | 1.04E+03 | nc | 2.30E+03 | nc | 1.04E+03 | ##### | 1.91E+06 | | E | 1.94E+06 |
| Carbon Tetrachloride | 56-23-5 | 1.28E-01 | c | 1.18E-01 | c | 1.28E-01 | ##### | 1.26E+05 | | E | 1.28E+05 |
| 1,2-Dichloroethane | 107-06-2 | 7.39E-02 | c | 6.88E-02 | c | 7.39E-02 | NA | 8.08E+03 | | T | 8.08E+03 |
| Benzene | 71-43-2 | 2.49E-01 | c | 2.16E-01 | c | 2.49E-01 | ##### | 1.60E+05 | | E | 1.56E+05 |
| Isooctane (2,2,4-trimethylpentane) | 540-84-1 | NA | | NA | | NA | NA | 3.50E+05 | | T | 3.50E+05 |
| Heptane | 142-82-5 | NA | | NA | | NA | NA | 1.80E+06 | | T | 1.80E+06 |
| Trichloroethane | 71-55-6 | 1.04E+03 | nc | 2.30E+03 | nc | 1.04E+03 | ##### | 1.91E+06 | | E | 1.94E+06 |
| Ethyl Acrylate | 140-88-5 | 1.40E-01 | c | NA | | 1.40E-01 | NA | 6.14E+04 | | T | 6.14E+04 |
| 1,2-Dichloropropane | 78-87-5 | 9.89E-02 | c | 9.21E-02 | c | 9.89E-02 | NA | 5.08E+05 | | T | 5.08E+05 |
| Methyl Methacrylate | 80-62-6 | 7.30E+02 | nc | 7.30E+02 | nc | 7.30E+02 | NA | 4.09E+05 | | T | 4.09E+05 |
| Dibromomethane | 74-95-3 | 3.65E+01 | nc | 3.65E+01 | nc | 3.65E+01 | NA | 2.50E+05 | | T | 2.50E+05 |
| 1,4-Dioxane | 123-91-1 | 6.11E-01 | c | 5.89E-01 | c | 6.11E-01 | NA | 9.00E+04 | | T | 9.00E+04 |
| Bromodichloromethane | 75-27-4 | 1.08E-01 | c | 1.01E-01 | c | 1.08E-01 | NA | 4.00E+03 | | T | 4.00E+03 |
| 4-Methyl-2-Pentanone | 108-10-1 | 8.34E+01 | nc | 7.30E+01 | nc | 8.34E+01 | NA | 3.07E+05 | | T | 3.07E+05 |
| Toluene | 108-88-3 | 4.02E+02 | nc | 4.16E+02 | nc | 4.02E+02 | ##### | 1.89E+05 | | E | 1.88E+05 |
| Octane | 111-65-9 | NA | | NA | | NA | NA | NA | | | NA |
| trans-1,3-Dichloropropene | 10061-02-6 | 5.17E-02 | c | 4.82E-02 | c | 5.17E-02 | NA | NA | | | NA |
| Ethyl Methacrylate | 97-63-2 | 3.29E+02 | nc | 3.29E+02 | nc | 3.29E+02 | NA | NA | | | NA |
| 1,1,2-Trichloroethane | 79-00-5 | 1.20E-01 | c | 1.12E-01 | c | 1.20E-01 | NA | 1.64E+05 | | T | 1.64E+05 |
| Tetrachloroethene | 127-18-4 | 3.31E+00 | c | 3.13E+00 | c | 3.31E+00 | NA | 6.78E+05 | | T | 6.78E+05 |
| 2-Hexanone | 591-78-6 | NA | | 5.11E+00 | nc | 5.11E+00 | NA | 4.09E+04 | | T | 4.09E+04 |
| Dibromochloromethane | 124-48-1 | 8.00E-02 | c | 7.45E-02 | c | 8.00E-02 | NA | 6.00E+03 | | T | 6.00E+03 |

Appendix C: Health-Based Screening Levels and Acute Toxicity Values

| Compound | CAS # | Region 9 PRG (µg/m ³) | Toxicity Endpoint (c or nc) | Region 3 RBC (µg/m ³) | Toxicity Endpoint (c or nc) | HBSL (µg/m ³) | ERPG (µg/m ³) | TEEL (µg/m ³) | AEGL (µg/m ³) | Source (T or E) | ATV (µg/m ³) |
|---------------------------------|------------|---|-----------------------------------|---|-----------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|--------------------|-----------------------------|
| 1,2-Dibromoethane | 106-93-4 | 8.73E-03 | c | 8.24E-03 | c | 8.73E-03 | NA | 1.54E+05 | | T | 1.54E+05 |
| Chlorobenzene | 108-90-7 | 6.21E+01 | nc | 6.21E+01 | nc | 6.21E+01 | NA | 1.38E+05 | | T | 1.38E+05 |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 2.60E-01 | c | 2.41E-01 | c | 2.60E-01 | NA | 5.15E+04 | | T | 5.15E+04 |
| Ethylbenzene | 100-41-4 | 1.06E+03 | nc | 1.06E+03 | nc | 1.06E+03 | NA | 5.43E+05 | | T | 5.43E+05 |
| m&p-Xylene | 108-38-3 | 7.30E+02 | nc | 7.30E+03 | nc | 7.30E+02 | NA | 6.51E+05 | | T | 6.51E+05 |
| o-Xylene | 95-47-6 | 7.30E+02 | nc | 7.30E+03 | nc | 7.30E+02 | NA | 6.51E+05 | | T | 6.51E+05 |
| Styrene | 100-42-5 | 1.06E+03 | nc | 1.04E+03 | nc | 1.06E+03 | ##### | 2.13E+05 | | E | 2.13E+05 |
| Bromoform | 75-25-2 | 1.75E+00 | c | 1.61E+00 | c | 1.75E+00 | NA | 6.20E+03 | | T | 6.20E+03 |
| Cumene | 98-82-8 | 4.02E+02 | nc | 4.02E+02 | nc | 4.02E+02 | NA | 2.46E+05 | | T | 2.46E+05 |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 3.31E-02 | c | 3.13E-02 | c | 3.31E-02 | NA | 2.06E+04 | | T | 2.06E+04 |
| 1,2,3-Trichloropropane | 96-18-4 | 9.61E-04 | c | 3.13E-03 | c | 9.61E-04 | NA | 6.03E+04 | | T | 6.03E+04 |
| Bromobenzene | 108-86-1 | 1.04E+01 | nc | NA | nc | 1.04E+01 | NA | 4.82E+04 | | T | 4.82E+04 |
| 4-Ethyltoluene | 622-96-8 | NA | | NA | | NA | NA | 1.25E+05 | | T | 1.25E+05 |
| 1,3,5-Trimethylbenzene | 108-67-8 | 6.21E+00 | nc | 6.21E+00 | nc | 6.21E+00 | NA | 3.68E+05 | | T | 3.68E+05 |
| Alpha Methyl Styrene | 98-83-9 | 2.56E+02 | nc | 2.56E+02 | nc | 2.56E+02 | NA | NA | | T | NA |
| 1,2,4-Trimethylbenzene | 95-63-6 | 6.21E+00 | nc | 6.21E+00 | nc | 6.21E+00 | NA | 1.80E+05 | | T | 1.80E+05 |
| 1,3-Dichlorobenzene | 541-73-1 | 3.29E+00 | nc | 3.29E+00 | nc | 3.29E+00 | NA | 3.61E+04 | | T | 3.61E+04 |
| 1,4-Dichlorobenzene | 106-46-7 | 3.06E-01 | c | 2.85E-01 | c | 3.06E-01 | ##### | 6.61E+05 | | T | 6.61E+05 |
| Benzyl Chloride | 100-44-7 | 3.95E-02 | c | 3.68E-02 | c | 3.96E-02 | ##### | 5.17E+03 | | E | 5.20E+03 |
| 1,2-Dichlorobenzene | 95-50-1 | 2.09E+02 | nc | 3.29E+01 | nc | 2.09E+02 | NA | 3.01E+05 | | T | 3.01E+05 |
| Hexachlorethane | 67-72-1 | 4.80E-01 | c | 4.47E-01 | c | 4.80E-01 | NA | 2.90E+04 | | T | 2.90E+04 |
| 1,2,4-Trichlorobenzene | 120-82-1 | 2.08E+02 | nc | 2.08E+02 | nc | 2.08E+02 | NA | 3.71E+04 | | T | 3.71E+04 |
| Hexachlorobutadiene | 87-68-3 | 8.73E-02 | c | 8.03E-02 | c | 8.73E-02 | ##### | 3.20E+04 | | E | 3.21E+04 |
| Hydrocarbons | | | | | | | | | | | |
| Methane | 74-82-8 | NA | | NA | | NA | NA | 3.30E+06 | | T | 3.30E+06 |
| Ethylene | 74-85-1 | NA | | NA | | NA | NA | 4.60E+05 | | T | 4.60E+05 |
| Acetylene | 74-86-2 | NA | | NA | | NA | NA | NA | | | NA |
| Ethane | 74-84-0 | NA | | NA | | NA | NA | NA | | | NA |
| Propylene | 115-07-1 | NA | | NA | | NA | NA | NA | | | NA |
| Propane | 74-98-6 | NA | | NA | | NA | NA | 3.78E+06 | | T | 3.78E+06 |
| Propyne (methyl acetylene) | 74-99-7 | NA | | NA | | NA | NA | 2.79E+06 | | T | 2.79E+06 |
| Isobutane | 75-28-5 | NA | | NA | | NA | NA | 9.52E+05 | | T | 9.52E+05 |
| 1-Butene/Isobutylene (115-11-7) | 106-98-9 | NA | | NA | | NA | NA | 6.87E+06 | | T | 6.87E+06 |
| 1,3-Butadiene/butane | 106-99-0 | 3.74E-03 | c | 3.48E-03 | c | 3.74E-03 | ##### | 2.21E+04 | | E | 2.20E+04 |
| cis-butene | 25167-67-3 | NA | | NA | | NA | NA | 1.72E+04 | NA | T | 1.72E+04 |

Appendix C: Health-Based Screening Levels and Acute Toxicity Values

| Compound | CAS # | Region 9 PRG (µg/m³) | Toxicity Endpoint (c or nc) | Region 3 RBC (µg/m³) | Toxicity Endpoint (c or nc) | HBSL (µg/m³) | ERPG (µg/m³) | TEEL (µg/m³) | AEGL (µg/m³) | Source (T or E) | ATV (µg/m³) |
|-----------------------------|------------|----------------------------|-----------------------------------|----------------------------|-----------------------------------|-----------------|-----------------|-----------------|-----------------|--------------------|----------------|
| 1-Butyne | 107-00-6 | NA | | NA | | NA | NA | NA | | | NA |
| trans-Butene | 25167-67-3 | NA | | NA | | NA | NA | 1.72E+04 | NA | T | 1.72E+04 |
| 2-Butyne (crotonylene) | 503-17-3 | NA | | NA | | NA | NA | NA | | | NA |
| n-Pentane | 109-66-0 | NA | | NA | | NA | NA | 1.80E+06 | | T | 1.80E+06 |
| n-Hexane | 110-54-3 | 2.10E+02 | nc | 2.08E+02 | nc | 2.10E+02 | NA | 5.28E+05 | | T | 5.28E+05 |
| SVOCs | | | | | | | | | | | |
| n-nitrosodimethylamine | 62-75-9 | 1.37E-04 | c | 1.23E-04 | c | 1.37E-04 | NA | 2.50E+03 | | T | 2.50E+03 |
| bis(2-chloroethyl)ether | 111-44-4 | 5.82E-03 | c | 5.69E-03 | c | 5.82E-03 | NA | 5.85E+04 | | T | 5.85E+04 |
| phenol | 108-95-2 | 2.19E+03 | nc | 2.19E+03 | nc | 2.19E+03 | NA | 3.85E+04 | | T | 3.85E+04 |
| 2-chlorophenol | 95-57-8 | 1.83E+01 | nc | 1.83E+01 | nc | 1.83E+01 | NA | 5.25E+03 | | T | 5.25E+03 |
| 1,3-Dichlorobenzene | 541-73-1 | 3.29E+00 | nc | 3.29E+00 | nc | 3.29E+00 | NA | 3.61E+04 | | T | 3.61E+04 |
| 1,4-dichlorobenzene | 106-46-7 | 3.06E-01 | c | 2.85E-01 | c | 3.06E-01 | NA | 6.61E+05 | | T | 6.61E+05 |
| 1,2-dichlorobenzene | 95-50-1 | 2.09E+02 | nc | 3.29E+01 | nc | 2.09E+02 | NA | 3.01E+05 | | T | 3.01E+05 |
| benzyl alcohol | 100-51-6 | 1.10E+03 | nc | 1.10E+03 | nc | 1.10E+03 | NA | 5.53E+04 | | T | 5.53E+04 |
| bis(2-chloroisopropyl)ether | 108-60-1 | 1.92E-01 | c | 1.79E-01 | c | 1.92E-01 | NA | 6.99E+04 | | T | 6.99E+04 |
| 2-methylphenol | 95-48-7 | 1.83E+02 | nc | 1.83E+02 | nc | 1.83E+02 | NA | NA | | | NA |
| hexachloroethane | 67-72-1 | 4.80E-01 | c | 4.47E-01 | c | 4.80E-01 | NA | 2.90E+04 | | T | 2.90E+04 |
| n-nitroso-di-n-propylamine | 621-64-7 | 9.61E-04 | c | 8.94E-04 | c | 9.61E-04 | NA | 2.00E+02 | | T | 2.00E+02 |
| 4-methylphenol | 106-44-5 | 1.83E+02 | nc | 1.83E+02 | nc | 1.83E+02 | NA | NA | | | NA |
| nitrobenzene | 98-95-3 | 2.09E+00 | nc | 2.19E+00 | nc | 2.09E+00 | NA | 1.51E+04 | | T | 1.51E+04 |
| isophorone | 78-59-1 | 7.08E+00 | c | 6.59E+00 | c | 7.08E+00 | NA | 2.83E+04 | | T | 2.83E+04 |
| 2-nitrophenol | 88-75-5 | NA | | NA | | NA | NA | NA | | | NA |
| 2,4-dimethylphenol | 105-67-9 | 7.30E+01 | nc | 7.30E+01 | nc | 7.30E+01 | NA | NA | | | NA |
| bis(2-chloroethoxy)methane | 111-91-1 | NA | | NA | | NA | NA | NA | | | NA |
| 2,4-dichlorophenol | 120-83-2 | 1.10E+01 | nc | 1.10E+01 | nc | 1.10E+01 | NA | 3.00E+04 | | T | 3.00E+04 |
| 1,2,4-trichlorobenzene | 120-82-1 | 2.08E+02 | nc | 2.08E+02 | nc | 2.08E+02 | NA | 3.71E+04 | | T | 3.71E+04 |
| naphthalene | 91-20-3 | 3.13E+00 | nc | 3.29E+00 | nc | 3.13E+00 | NA | 7.86E+04 | | T | 7.86E+04 |
| 4-chloroaniline | 106-47-8 | 1.46E+01 | nc | 1.46E+01 | nc | 1.46E+01 | NA | 3.00E+04 | | T | 3.00E+04 |
| hexachlorobutadiene | 87-68-3 | 8.62E-02 | c | 8.03E-02 | c | 8.62E-02 | ##### | 3.20E+04 | | E | 3.21E+04 |
| 4-chloro-3-methylphenol | 59-50-7 | NA | | NA | | NA | NA | 2.00E+04 | | T | 2.00E+04 |
| 2-methylnaphthalene | 91-57-6 | NA | | 7.30E+01 | nc | 7.30E+01 | NA | 2.00E+04 | | T | 2.00E+04 |
| hexachlorocyclopentadiene | 77-47-4 | 7.30E-02 | nc | 7.30E-02 | nc | 7.30E-02 | NA | 2.23E+02 | | T | 2.23E+02 |
| 2,4,6-trichlorophenol | 88-06-2 | 1.10E+02 | nc | 1.10E+02 | nc | 1.10E+02 | NA | 3.00E+04 | | T | 3.00E+04 |
| 2,4,5-trichlorophenol | 95-95-4 | 3.65E+02 | nc | 3.65E+02 | nc | 3.65E+02 | NA | 3.00E+04 | | T | 3.00E+04 |
| 2-chloronaphthalene | 91-58-7 | 2.92E+02 | nc | 2.92E+02 | nc | 2.92E+02 | NA | 6.00E+02 | | T | 6.00E+02 |
| 2-nitroaniline | 88-74-4 | 2.09E-01 | nc | 2.08E-01 | nc | 2.09E-01 | NA | NA | | | NA |
| Acenaphthylene | 208-96-8 | NA | | NA | | NA | NA | 2.00E+02 | | T | 2.00E+02 |

Appendix C: Health-Based Screening Levels and Acute Toxicity Values

| Compound | CAS # | Region 9 PRG (µg/m ³) | Toxicity Endpoint (c or nc) | Region 3 RBC (µg/m ³) | Toxicity Endpoint (c or nc) | HBSL (µg/m ³) | ERPG (µg/m ³) | TEEL (µg/m ³) | AEGL (µg/m ³) | Source (T or E) | ATV (µg/m ³) |
|----------------------------|-----------|---|-----------------------------------|---|-----------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|--------------------|-----------------------------|
| dimethylphthalate | 131-11-3 | 3.65E+04 | nc | 3.65E+04 | nc | 3.65E+04 | NA | 1.50E+04 | | T | 1.50E+04 |
| 2,6-dinitrotoluene | 606-20-2 | 3.65E+00 | nc | 3.65E+00 | nc | 3.65E+00 | NA | 6.00E+02 | | T | 6.00E+02 |
| acenaphthene | 83-32-9 | 2.19E+02 | nc | 2.19E+02 | nc | 2.19E+02 | NA | 1.25E+03 | | T | 1.25E+03 |
| 3-nitroaniline | 99-09-2 | NA | | NA | | NA | NA | NA | | | NA |
| 2,4-dinitrophenol | 51-28-5 | 7.30E+00 | nc | 7.30E+00 | nc | 7.30E+00 | NA | 7.50E+03 | | T | 7.50E+03 |
| dlbenzofuran | 132-64-9 | 1.46E+01 | nc | 1.46E+01 | nc | 1.46E+01 | NA | NA | | | NA |
| 2,4-dinitrotoluene | 121-14-2 | 7.30E+00 | nc | 7.30E+00 | nc | 7.30E+00 | NA | 6.00E+02 | | T | 6.00E+02 |
| 4-nitrophenol | 100-02-7 | 2.92E+01 | nc | 2.92E+01 | nc | 2.92E+01 | NA | 3.00E+04 | | T | 3.00E+04 |
| Fluorene | 86-73-7 | 1.46E+02 | nc | 1.46E+02 | nc | 1.46E+02 | NA | 7.50E+04 | | T | 7.50E+04 |
| 4-chlorophenyl-phenylether | 7005-72-3 | NA | | NA | | NA | NA | NA | | | NA |
| diethylphthalate | 84-66-2 | 2.92E+03 | nc | 2.92E+03 | nc | 2.92E+03 | NA | 1.50E+04 | | T | 1.50E+04 |
| 4-nitroaniline | 100-01-6 | NA | | NA | | NA | NA | 9.00E+03 | | T | 9.00E+03 |
| 4,6-dinitro-2-methylphenol | 534-52-1 | NA | | 3.65E-01 | nc | 3.65E-01 | NA | 5.00E+02 | | T | 5.00E+02 |
| n-nitrosodiphenylamine(1) | 86-30-6 | 1.37E+00 | c | 1.28E+00 | c | 1.37E+00 | NA | NA | | | NA |
| 4-bromophenyl-phenylether | 101-55-3 | NA | | NA | | NA | NA | NA | | | NA |
| hexachlorobenzene | 118-74-1 | 4.18E-03 | c | 3.91E-03 | c | 4.18E-03 | NA | 7.50E+01 | | T | 7.50E+01 |
| pentachlorophenol | 87-86-5 | 5.60E-02 | c | 5.22E-02 | c | 5.60E-02 | NA | 1.50E+03 | | T | 1.50E+03 |
| phenanthrene | 85-01-8 | NA | | NA | | NA | NA | 2.00E+03 | | T | 2.00E+03 |
| anthracene | 120-12-7 | 1.10E+03 | nc | 1.10E+03 | nc | 1.10E+03 | NA | 6.00E+03 | | T | 6.00E+03 |
| di-n-butylphthalate | 84-74-2 | 3.65E+02 | nc | 3.65E+02 | nc | 3.65E+02 | NA | 1.50E+04 | | T | 1.50E+04 |
| fluoranthene | 206-44-0 | 1.46E+02 | nc | 1.46E+02 | nc | 1.46E+02 | NA | 3.00E+01 | | T | 3.00E+01 |
| pyrene | 129-00-0 | 1.10E+02 | nc | 1.10E+02 | nc | 1.10E+02 | NA | 1.50E+04 | | T | 1.50E+04 |
| butylbenzylphthalate | 85-68-7 | 7.30E+02 | nc | 7.30E+02 | nc | 7.30E+02 | NA | 5.00E+05 | | T | 5.00E+05 |
| benzo(a)anthracene | 56-55-3 | 2.17E-02 | c | 8.58E-03 | c | 2.17E-02 | NA | 6.00E+02 | | T | 6.00E+02 |
| chrysene | 218-01-9 | 2.17E+00 | c | 8.58E-01 | c | 2.17E+00 | NA | 2.00E+02 | | T | 2.00E+02 |
| 3,3-dichlorobenzidine | 91-94-1 | 1.50E-02 | c | 1.39E-02 | c | 1.50E-02 | NA | 6.21E+03 | | T | 6.21E+03 |
| bis(2-ethylhexyl)phthalate | 117-81-7 | 4.80E-01 | c | 4.47E-01 | c | 4.80E-01 | NA | 1.00E+04 | | T | 1.00E+04 |
| di-n-octylphthalate | 117-84-0 | 7.30E+01 | nc | 7.30E+01 | nc | 7.30E+01 | NA | 1.50E+05 | | T | 1.50E+05 |
| benzo(b)fluoranthene | 205-99-2 | 2.17E-02 | c | 8.58E-03 | c | 2.17E-02 | NA | NA | | | NA |
| benzo(k)fluoranthene | 207-08-9 | 2.17E-01 | c | 8.58E-02 | c | 2.17E-01 | NA | NA | | | NA |
| benzo(a)pyrene | 50-32-8 | 2.17E-03 | c | 2.02E-03 | c | 2.17E-03 | NA | 7.50E+03 | | T | 7.50E+03 |
| indeno(1,2,3-cd)pyrene | 193-39-5 | 2.17E-02 | c | 8.58E-03 | c | 2.17E-02 | NA | NA | | | NA |
| dibenz(a,h)anthracene | 53-70-3 | 2.17E-03 | c | 8.58E-04 | c | 2.17E-03 | NA | 3.00E+04 | | T | 3.00E+04 |
| benzo(g,h,i)perylene | 191-24-2 | NA | | NA | | NA | NA | 3.00E+04 | | T | 3.00E+04 |
| TO-13 (PAHs) | | | | | | | | | | | |
| naphthalene | 91-20-3 | 3.13E+00 | nc | 3.29E+00 | nc | 3.13E+00 | NA | 7.86E+04 | | T | 7.86E+04 |

Appendix C: Health-Based Screening Levels and Acute Toxicity Values

| Compound | CAS # | Region 9 PRG (µg/m ³) | Toxicity Endpoint (c or nc) | Region 3 RBC (µg/m ³) | Toxicity Endpoint (c or nc) | HBSL (µg/m ³) | ERPG (µg/m ³) | TEEL (µg/m ³) | AEGL (µg/m ³) | Source (T or E) | ATV (µg/m ³) |
|-------------------------------------|------------|---|-----------------------------------|---|-----------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|--------------------|-----------------------------|
| acenaphthylene | 208-96-8 | NA | | NA | | NA | NA | 2.00E+02 | | T | 2.00E+02 |
| Acenaphthene | 83-32-9 | 2.19E+02 | nc | 2.19E+02 | nc | 2.19E+02 | NA | 1.25E+03 | | T | 1.25E+03 |
| fluorene | 86-73-7 | 1.46E+02 | nc | 1.46E+02 | nc | 1.46E+02 | NA | 7.50E+04 | | T | 7.50E+04 |
| phenanthrene | 85-01-8 | NA | | NA | | NA | NA | 2.00E+03 | | T | 2.00E+03 |
| anthracene | 120-12-7 | 1.10E+03 | nc | 1.10E+03 | nc | 1.10E+03 | NA | 6.00E+03 | | T | 6.00E+03 |
| fluoranthene | 206-44-0 | 1.46E+02 | nc | 1.46E+02 | nc | 1.46E+02 | NA | 3.00E+01 | | T | 3.00E+01 |
| pyrene | 129-00-0 | 1.10E+02 | nc | 1.10E+02 | nc | 1.10E+02 | NA | 1.50E+04 | | T | 1.50E+04 |
| benzo(a)anthracene | 56-55-3 | 2.17E-02 | c | 8.58E-03 | c | 2.17E-02 | NA | 6.00E+02 | | T | 6.00E+02 |
| chrysene | 218-01-9 | 2.17E+00 | c | 8.58E-01 | c | 2.17E+00 | NA | 2.00E+02 | | T | 2.00E+02 |
| benzo(b)fluoranthene | 205-99-2 | 2.17E-02 | c | 8.58E-03 | c | 2.17E-02 | NA | NA | | | NA |
| benzo(k)fluoranthene | 207-08-9 | 2.17E-01 | c | 8.58E-02 | c | 2.17E-01 | NA | NA | | | NA |
| Benzo(e)pyrene | 192-97-2 | NA | | NA | | NA | NA | NA | | | NA |
| benzo(a)pyrene | 50-32-8 | 2.17E-03 | c | 2.02E-03 | c | 2.17E-03 | NA | 7.50E+03 | | T | 7.50E+03 |
| indeno(1,2,3-cd)pyrene | 193-39-5 | 2.17E-02 | c | 8.58E-03 | c | 2.17E-02 | NA | NA | | | NA |
| dibenz(a,h)anthracene | 53-70-3 | 2.17E-03 | c | 8.58E-04 | c | 2.17E-03 | NA | 3.00E+04 | | T | 3.00E+04 |
| benzo(g,h,i)perylene | 191-24-2 | NA | | NA | | NA | NA | 3.00E+04 | | T | 3.00E+04 |
| Dioxins and Furans | | | | | | | | | | | |
| 2378-Tetrachlorodibenzo-p-dioxin | 1746-01-6 | 4.48E-08 | c | 4.17E-08 | c | 4.48E-08 | NA | 3.50E+00 | | T | 3.50E+00 |
| 12378-Pentachlorodibenzo-p-dioxin | 40321-76-4 | NA | | NA | | NA | NA | 2.50E+00 | | T | 2.50E+00 |
| 123478-Hexachlorodibenzo-p-dioxin | 39227-28-6 | NA | | NA | | NA | NA | NA | | | NA |
| 123678-Hexachlorodibenzo-p-dioxin | 57653-85-7 | NA | | NA | | NA | NA | 1.50E+01 | | T | 1.50E+01 |
| 123789-Hexachlorodibenzo-p-dioxin | 19408-74-3 | 1.48E-06 | c | 1.38E-06 | c | 1.48E-06 | NA | NA | | | NA |
| 1234678-Heptachlorodibenzo-p-dioxin | 35822-46-9 | NA | | NA | | NA | NA | NA | | | NA |
| Octachlorodibenzo(p)dioxin | 3268-87-9 | NA | | NA | | NA | NA | 1.50E+02 | | T | 1.50E+02 |
| 2378-Tetrachlorodibenzo-p-furan | 51207-31-9 | NA | | NA | | NA | NA | 2.00E+00 | | T | 2.00E+00 |
| 12378-Pentachlorodibenzo-p-furan | 57117-41-6 | NA | | NA | | NA | NA | NA | | | NA |
| 23478-Pentachlorodibenzo-o-furan | 57117-31-4 | NA | | NA | | NA | NA | 7.50E-02 | | T | 7.50E-02 |
| 123478-Hexachlorodibenzo-p-furan | 70648-26-9 | NA | | NA | | NA | NA | 7.50E+00 | | T | 7.50E+00 |
| 123678-Hexachlorodibenzo-p-furan | 57117-44-9 | NA | | NA | | NA | NA | 2.50E+00 | | T | 2.50E+00 |
| 123789-Hexachlorodibenzo-p-furan | 72918-21-9 | NA | | NA | | NA | NA | NA | | | NA |
| 234678-Hexachlorodibenzo-p-furan | 60851-34-5 | NA | | NA | | NA | NA | 1.50E+00 | | T | 1.50E+00 |
| 1234678-Heptachlorodibenzo-p-furan | 67562-39-4 | NA | | NA | | NA | NA | NA | | | NA |
| 1234789-Heptachlorodibenzo-p-furan | 55673-89-7 | NA | | NA | | NA | NA | NA | | | NA |
| Octachlorodibenzofuran | 39001-02-0 | NA | | NA | | NA | NA | 3.00E+02 | | T | 3.00E+02 |
| Energetics | | | | | | | | | | | |
| Nitrobenzene | 98-95-3 | 2.09E+00 | nc | 2.19E+00 | nc | 2.09E+00 | NA | 1.51E+04 | | T | 1.51E+04 |
| 2-Nitrotoluene | 88-72-2 | 3.65E+01 | nc | 3.65E+01 | nc | 3.65E+01 | NA | NA | | | NA |

Appendix C: Health-Based Screening Levels and Acute Toxicity Values

| Compound | CAS # | Region 9 PRG (µg/m ³) | Toxicity Endpoint (c or nc) | Region 3 RBC (µg/m ³) | Toxicity Endpoint (c or nc) | HBSL (µg/m ³) | ERPG (µg/m ³) | TEEL (µg/m ³) | AEGL (µg/m ³) | Source (T or E) | ATV (µg/m ³) |
|-----------------------------|------------|---|-----------------------------------|---|-----------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|--------------------|-----------------------------|
| 3-Nitrotoluene | 99-08-1 | 3.65E+01 | nc | 7.30E+01 | nc | 3.65E+01 | NA | NA | | | NA |
| 4-Nitrotoluene | 99-99-0 | 3.65E+01 | nc | 3.65E+01 | nc | 3.65E+01 | NA | 3.37E+04 | | T | 3.37E+04 |
| Nitroglycerine | 55-63-0 | 4.80E-01 | c | 4.47E-01 | c | 4.80E-01 | NA | NA | | | NA |
| 1,3-Dinitrobenzene | 99-65-0 | 3.65E-01 | nc | 3.65E-01 | nc | 3.65E-01 | NA | 3.00E+03 | | T | 3.00E+03 |
| 2,6-Dinitrotoluene | 606-20-2 | 3.65E+00 | nc | 3.65E+00 | nc | 3.65E+00 | NA | 6.00E+02 | | T | 6.00E+02 |
| 2,4-Dinitrotoluene | 121-14-2 | 7.30E+00 | nc | 7.30E+00 | nc | 7.30E+00 | NA | 6.00E+02 | NA | T | 6.00E+02 |
| 1,3,5-Trinitrobenzene | 99-35-4 | 1.10E+02 | nc | 1.10E+02 | nc | 1.10E+02 | NA | 3.00E+04 | | T | 3.00E+04 |
| 2,4,6-Trinitrotoluene | 118-96-7 | 2.24E-01 | c | 2.09E-01 | c | 2.24E-01 | NA | 2.50E+04 | | T | 2.50E+04 |
| RDX | 121-82-4 | 6.11E-02 | c | 5.69E-02 | c | 6.11E-02 | NA | NA | | | NA |
| 4-Amino-2,6-Dinitrotoluene | 19406-51-0 | NA | | NA | | NA | NA | NA | | | NA |
| 2-Amino-2,6-Dinitrotoluene | 35572-78-2 | NA | | NA | | NA | NA | 1.50E+04 | | T | 1.50E+04 |
| Tetryl | 479-45-8 | 3.65E+01 | nc | 3.65E+01 | nc | 3.65E+01 | NA | NA | | | NA |
| HMX | 2691-41-0 | 1.83E+02 | nc | 1.83E+02 | nc | 1.83E+02 | NA | NA | | | NA |
| Pentaerythritoltetranitrate | 78-11-5 | NA | | NA | | NA | NA | 5.00E+01 | | T | 5.00E+01 |
| Dibutyl Phthalate | 84-74-2 | 3.65E+02 | nc | 3.65E+02 | nc | 3.65E+02 | NA | 1.50E+04 | | T | 1.50E+04 |
| Diethyl Phthalate | 117-81-7 | 4.80E-01 | c | 4.47E-01 | c | 4.80E-01 | NA | 1.00E+04 | | T | 1.00E+04 |
| Diphenylamine | 122-39-4 | 9.13E+01 | nc | 9.13E+01 | nc | 9.13E+01 | NA | 3.00E+04 | | T | 3.00E+04 |

Footnotes:

PRG: Preliminary Remediation Goals

c = cancer

nc = non-cancer

RBC: Risk-Based Concentration

HBSL: Health-Based Screening Level

(E) ERPG: Emergency Response Planning Guidelines

(T) TEEL: Temporary Emergency Exposure Limits

(A) AEGL: Acute Exposure Guideline Level

ATV: Acute Toxicity Value

NA: Not Available

APPENDIX D
RISK ASSESSMENT DATA

Table D-1: Comparison of Air Concentrations With Health-Based Values

| Cartridge, 5.56-mm Ball Practice, M862 (M16A1) DODIC: A065 | | | | | | | |
|---|--|---|--------------------------------|------|--|---|---------------------------------|
| Compound | C _{chronic} (µg/m ³) | Health-Based Screening Level (µg/m ³) | C _{chronic} / HBSL | > 1? | C _{acute} (µg/m ³) | Acute Toxicity Value (µg/m ³) | C _{acute} /ATV > 1? |
| Permanent Gases | | | | | | | |
| Ammonia (NH ₃) | 5.02E-02 | 1.04E+02 | 4.81E-04 | no | 4.40E+00 | 1.75E+04 | 2.51E-04 |
| Carbon Dioxide (CO ₂) | 9.16E+00 | NV | | na | 3.21E+03 | 5.40E+07 | 5.95E-05 |
| Carbon Monoxide (CO) | 1.16E+01 | 1.00E+04 | 1.16E-03 | no | 1.01E+03 | 2.30E+05 | 4.40E-03 |
| Oxides of Nitrogen (as NO) | 3.53E-01 | 1.00E+02 | 3.53E-03 | no | 1.24E+02 | 3.08E+04 | 4.02E-03 |
| Sulfur Dioxide (SO ₂) | 3.76E-03 | 8.00E+01 | 4.70E-05 | no | 3.29E-01 | 7.89E+02 | 4.17E-04 |
| Acid Gases | | | | | | | |
| Hydrogen fluoride | NA | NV | | na | NA | 1.60E+03 | na |
| Hydrogen chloride | NA | 2.08E+01 | | na | NA | 4.50E+03 | na |
| Hydrogen bromide | NA | NV | | na | NA | 9.93E+03 | na |
| Nitric Acid | 3.61E-02 | NV | | na | 3.17E+00 | 1.30E+03 | 2.44E-03 |
| Phosphoric acid | NA | 1.04E+01 | | na | NA | 3.00E+03 | na |
| Sulfuric Acid | 6.39E-03 | NV | | na | 5.60E-01 | 2.00E+03 | 2.80E-04 |
| Cyanide | | | | | | | |
| Particulate Cyanide | 2.68E-04 | 7.30E+01 | 3.67E-06 | no | 9.39E-02 | 5.00E+03 | 1.88E-05 |
| Hydrogen Cyanide | 3.79E-02 | 3.13E+00 | 1.21E-02 | no | 1.33E+01 | 5.17E+03 | 2.57E-03 |
| Particulates | | | | | | | |
| Total Suspended Particulate | 3.60E-01 | 5.00E+01 | 7.20E-03 | no | 3.15E+01 | NA | na |
| PM ₁₀ | 3.52E-01 | 5.00E+01 | 7.04E-03 | no | 3.08E+01 | NA | na |
| PM _{2.5} | 3.14E-01 | 1.50E+01 | 2.09E-02 | no | 2.75E+01 | NA | na |
| Metals | | | | | | | |
| Aluminum | 2.93E-03 | 5.11E+00 | 5.73E-04 | no | 1.03E+00 | 3.00E+04 | 3.42E-05 |
| Antimony | 5.12E-02 | 1.46E+00 | 3.51E-02 | no | 1.79E+01 | 1.50E+03 | 1.20E-02 |
| Arsenic | 9.18E-05 | 4.47E-04 | 2.06E-01 | no | 7.51E-02 | 3.00E+01 | 2.50E-03 |
| Barium | 5.15E-02 | 5.21E-01 | 9.88E-02 | no | 1.80E+01 | 1.50E+03 | 1.20E-02 |
| Beryllium | NA | 8.00E-04 | | na | NA | 5.00E+00 | na |
| Cadmium | NA | 1.07E-03 | | na | NA | 3.00E+01 | na |
| Calcium | 3.84E-03 | NV | | na | 1.35E+00 | 3.00E+04 | 4.49E-05 |
| Chromium | NA | 1.53E-04 | | na | NA | 1.50E+03 | na |
| Cobalt | NA | 2.20E+02 | | na | NA | 6.00E+01 | na |
| Copper | 5.97E-03 | 1.46E+02 | 4.09E-05 | no | 2.09E+00 | 3.00E+03 | 6.98E-04 |
| Lead | 9.65E-02 | 1.50E+00 | 6.43E-02 | no | 3.38E+01 | 1.50E+02 | 2.25E-01 |

Table D-1: Comparison of Air Concentrations With Health-Based Values

| Cartridge, 5.56-mm Ball Practice, M862 (M16A1) DODIC: A065 | | | | | | | |
|---|--|---|--------------------------------|------|--|---|---------------------------------|
| Compound | C _{chronic} (µg/m ³) | Health-Based Screening Level (µg/m ³) | C _{chronic} / HBSL | > 1? | C _{acute} (µg/m ³) | Acute Toxicity Value (µg/m ³) | C _{acute} /ATV > 1? |
| Magnesium | NA | NV | | na | NA | 3.00E+04 | na |
| Manganese | NA | 5.11E-02 | | na | NA | 3.00E+03 | na |
| Nickel | NA | 7.30E+01 | | na | NA | 3.00E+03 | na |
| Selenium | NA | 1.83E+01 | | na | NA | 6.00E+02 | na |
| Silver | NA | 1.83E+01 | | na | NA | 3.00E+02 | na |
| Thallium | NA | 2.56E-01 | | na | NA | 3.00E+02 | na |
| Vanadium | NA | 2.56E+01 | | na | NA | 1.50E+02 | na |
| Zinc | 2.81E-03 | 1.10E+03 | 2.56E-06 | no | 9.83E-01 | 3.00E+04 | 3.28E-05 |
| TO-11 Carbonyls | | | | | | | |
| Formaldehyde | 6.62E-04 | 1.48E-01 | 4.48E-03 | no | 1.35E-01 | 1.23E+03 | 1.10E-04 |
| Acetaldehyde | NA | 8.73E-01 | | na | NA | 1.80E+04 | na |
| Acetone | NA | 3.65E+02 | | na | NA | 2.37E+06 | na |
| Acrolein | 3.57E-04 | 2.09E-02 | 1.71E-02 | no | 3.13E-02 | 2.30E+02 | 1.36E-04 |
| Propionaldehyde | NA | NV | | na | NA | 7.50E+04 | na |
| Crotonaldehyde | NA | 3.54E-03 | | na | NA | 5.72E+03 | na |
| Butyraldehyde | NA | NV | | na | NA | 7.38E+04 | na |
| Benzaldehyde | NA | 3.65E+02 | | na | NA | 1.50E+04 | na |
| Isovaleraldehyde | NA | NV | | na | NA | NA | na |
| Valeraldehyde | NA | NV | | na | NA | NA | na |
| o,m,p-Tolualdehyde | NA | NV | | na | NA | NA | na |
| Hexaldehyde | NA | NV | | na | NA | NA | na |
| 2,5-Dimethylbenzaldehyde | NA | NV | | na | NA | NA | na |
| VOCs | | | | | | | |
| Propene | 1.35E-03 | NV | | na | 1.18E-01 | NA | na |
| Dichlorodifluoromethane | NA | 2.09E+02 | | na | NA | 1.48E+07 | na |
| Chlorodifluoromethane | NA | 5.11E+04 | | na | NA | 4.41E+06 | na |
| Freon 114 | NA | NV | | na | NA | 2.10E+07 | na |
| Chloromethane | 6.88E-06 | 1.07E+00 | 6.45E-06 | no | 5.63E-03 | 2.06E+05 | 2.73E-08 |
| Vinyl Chloride | NA | 2.20E-02 | | na | NA | 1.28E+04 | na |
| 1,3-Butadiene | NA | 3.74E-03 | | na | NA | 2.20E+04 | na |
| Bromomethane | NA | 5.21E+00 | | na | NA | 5.82E+04 | na |
| Chloroethane | NA | 2.32E+00 | | na | NA | 2.64E+06 | na |

Table D-1: Comparison of Air Concentrations With Health-Based Values

| Cartridge, 5.56-mm Ball Practice, M862 (M16A1) DODIC: A065 | | | | | | | | |
|---|--|---|--------------------------------|------|--|---|-------------------------|------|
| Compound | C _{chronic} (µg/m ³) | Health-Based Screening Level (µg/m ³) | C _{chronic} / HBSL | > 1? | C _{acute} (µg/m ³) | Acute Toxicity Value (µg/m ³) | C _{acute} /ATV | > 1? |
| Dichlorofluoromethane | NA | 2.09E+02 | | na | NA | 1.48E+07 | | na |
| Trichlorofluoromethane | NA | 7.30E+02 | | na | NA | 2.81E+06 | | na |
| Pentane | NA | NV | | na | NA | 1.80E+06 | | na |
| Acrolein | 2.14E-03 | 2.09E-02 | 1.03E-01 | no | 1.88E-01 | 2.30E+02 | 8.16E-04 | no |
| 1,1-Dichloroethene | NA | 5.21E+02 | | na | NA | 7.92E+04 | | na |
| Freon 113 | NA | 3.13E+04 | | na | NA | 9.58E+06 | | na |
| Acetone | 1.13E-03 | 3.65E+02 | 3.09E-06 | no | 3.95E-01 | 2.37E+06 | 1.66E-07 | no |
| Methyl Iodide | NA | NV | | na | NA | 1.45E+05 | | na |
| Carbon Disulfide | 1.71E-04 | 7.30E+02 | 2.35E-07 | no | 6.01E-02 | 3.11E+04 | 1.93E-06 | no |
| Acetonitrile | 2.70E-03 | 6.20E+01 | 4.35E-05 | no | 9.46E-01 | 1.01E+05 | 9.38E-06 | no |
| 3-Chloropropene | NA | 1.04E+00 | | na | NA | 9.39E+03 | | na |
| Methylene Chloride | 2.21E-03 | 4.09E+00 | 5.40E-04 | no | 4.51E-01 | 6.96E+05 | 6.48E-07 | no |
| tert-Butyl Alcohol | NA | NV | | na | NA | 4.56E+05 | | na |
| Acrylonitrile | 1.75E-04 | 2.83E-02 | 6.21E-03 | no | 3.58E-02 | 2.17E+04 | 1.65E-06 | no |
| trans-1,2-Dichloroethene | NA | 7.30E+01 | | na | NA | 4.95E+04 | | na |
| Methyl t-Butyl Ether | NA | 3.13E+03 | | na | NA | 4.32E+05 | | na |
| Hexane | 1.02E-02 | 2.09E+02 | 4.89E-05 | no | 3.57E+00 | 5.28E+05 | 6.77E-06 | no |
| 1,1-Dichloroethane | NA | 5.21E+02 | | na | NA | 1.21E+06 | | na |
| Vinyl Acetate | NA | 2.09E+02 | | na | NA | 1.92E+04 | | na |
| cis-1,2-Dichloroethene | NA | 3.65E+01 | | na | NA | 7.92E+05 | | na |
| 2-Butanone | NA | 1.04E+03 | | na | NA | 8.85E+05 | | na |
| Ethyl Acetate | 2.26E-04 | 3.29E+03 | 6.89E-08 | no | 7.94E-02 | 1.44E+06 | 5.51E-08 | no |
| Methyl Acrylate | NA | 1.10E+02 | | na | NA | NA | | na |
| Chloroform | NA | 8.35E-02 | | na | NA | 9.76E+03 | | na |
| 1,1,1-Trichloroethane | 5.82E-06 | 1.04E+03 | 5.58E-09 | no | 5.10E-04 | 1.94E+06 | 2.62E-10 | no |
| Carbon Tetrachloride | NA | 1.28E-01 | | na | NA | 1.28E+05 | | na |
| 1,2-Dichloroethane | 5.45E-05 | 7.39E-02 | 7.38E-04 | no | 4.46E-02 | 8.08E+03 | 5.52E-06 | no |
| Benzene | 3.22E-03 | 2.49E-01 | 1.29E-02 | no | 6.58E-01 | 1.56E+05 | 4.22E-06 | no |
| Isooctane (2,2,4-trimethylpentane) | NA | NV | | na | NA | 3.50E+05 | | na |
| Heptane | NA | NV | | na | NA | 1.80E+06 | | na |
| Trichloroethane | NA | 1.04E+03 | | na | NA | 1.94E+06 | | na |
| Ethyl Acrylate | NA | 1.40E-01 | | na | NA | 6.14E+04 | | na |

Table D-1: Comparison of Air Concentrations With Health-Based Values

| Cartridge, 5.56-mm Ball Practice, M862 (M16A1) DODIC: A065 | | | | | | | |
|---|--|---|--------------------------------|------|--|---|-------------------------|
| Compound | C _{chronic} (µg/m ³) | Health-Based Screening Level (µg/m ³) | C _{chronic} / HBSL | > 1? | C _{acute} (µg/m ³) | Acute Toxicity Value (µg/m ³) | C _{acute} /ATV |
| 1,2-Dichloropropane | NA | 9.89E-02 | | na | NA | 5.08E+05 | na |
| Methyl Methacrylate | NA | 7.30E+02 | | na | NA | 4.09E+05 | na |
| Dibromomethane | NA | 3.65E+01 | | na | NA | 2.50E+05 | na |
| 1,4-Dioxane | NA | 6.11E-01 | | na | NA | 9.00E+04 | na |
| Bromodichloromethane | NA | 1.08E-01 | | na | NA | 4.00E+03 | na |
| 4-Methyl-2-Pentanone | NA | 8.34E+01 | | na | NA | 3.07E+05 | na |
| Toluene | 3.55E-04 | 4.02E+02 | 8.85E-07 | no | 3.11E-02 | 1.88E+05 | 1.66E-07 |
| Octane | NA | NV | | na | NA | NA | na |
| trans-1,3-Dichloropropene | NA | 5.17E-02 | | na | NA | NA | na |
| Ethyl Methacrylate | NA | 3.29E+02 | | na | NA | NA | na |
| 1,1,2-Trichloroethane | NA | 1.20E-01 | | na | NA | 1.64E+05 | na |
| Tetrachloroethene | NA | 3.31E+00 | | na | NA | 6.78E+05 | na |
| 2-Hexanone | NA | 5.11E+00 | | na | NA | 4.09E+04 | na |
| Dibromochloromethane | NA | 8.00E-02 | | na | NA | 6.00E+03 | na |
| 1,2-Dibromoethane | NA | 8.73E-03 | | na | NA | 1.54E+05 | na |
| Chlorobenzene | NA | 6.21E+01 | | na | NA | 1.38E+05 | na |
| 1,1,1,2-Tetrachloroethane | NA | 2.60E-01 | | na | NA | 5.15E+04 | na |
| Ethylbenzene | NA | 1.06E+03 | | na | NA | 5.43E+05 | na |
| m&p-Xylene | 2.72E-05 | 7.30E+02 | 3.73E-08 | no | 9.54E-03 | 6.51E+05 | 1.47E-08 |
| o-Xylene | 6.89E-05 | 7.30E+02 | 9.44E-08 | no | 2.41E-02 | 6.51E+05 | 3.71E-08 |
| Styrene | 6.76E-05 | 1.06E+03 | 6.39E-08 | no | 5.92E-03 | 2.13E+05 | 2.78E-08 |
| Bromoform | NA | 1.75E+00 | | na | NA | 6.20E+03 | na |
| Cumene | NA | 4.02E+02 | | na | NA | 2.46E+05 | na |
| 1,1,2,2-Tetrachloroethane | NA | 3.31E-02 | | na | NA | 2.06E+04 | na |
| 1,2,3-Trichloropropane | NA | 9.61E-04 | | na | NA | 6.03E+04 | na |
| Bromobenzene | NA | 1.04E+01 | | na | NA | 4.82E+04 | na |
| 4-Ethyltoluene | NA | NV | | na | NA | 1.25E+05 | na |
| 1,3,5-Trimethylbenzene | NA | 6.21E+00 | | na | NA | 3.68E+05 | na |
| Alpha Methyl Styrene | NA | 2.56E+02 | | na | NA | NA | na |
| 1,2,4-Trimethylbenzene | 2.31E-05 | 6.21E+00 | 3.72E-06 | no | 8.09E-03 | 1.80E+05 | 4.50E-08 |
| 1,3-Dichlorobenzene | NA | 3.29E+00 | | na | NA | 3.61E+04 | na |
| 1,4-Dichlorobenzene | NA | 3.06E-01 | | na | NA | 6.61E+05 | na |

Table D-1: Comparison of Air Concentrations With Health-Based Values

| Cartridge, 5.56-mm Ball Practice, M862 (M16A1) DODIC: A065 | | | | | | | | |
|---|--|---|--------------------------------|------|--|---|--------------------------|------|
| Compound | C _{chronic} (µg/m ³) | Health-Based Screening Level (µg/m ³) | C _{chronic} / HBSL | > 1? | C _{acute} (µg/m ³) | Acute Toxiclty Value (µg/m ³) | C _{acute} / ATV | > 1? |
| Benzyl Chloride | NA | 3.96E-02 | | na | NA | 5.20E+03 | | na |
| 1,2-Dichlorobenzene | NA | 2.09E+02 | | na | NA | 3.01E+05 | | na |
| Hexachlorethane | NA | 4.80E-01 | | na | NA | 2.90E+04 | | na |
| 1,2,4-Trichlorobenzene | NA | 2.08E+02 | | na | NA | 3.71E+04 | | na |
| Hexachlorobutadiene | NA | 8.73E-02 | | na | NA | 3.21E+04 | | na |
| Hydrocarbons | | | | | | | | |
| Methane | 6.45E-02 | NV | | | 2.26E+01 | 3.30E+06 | 6.85E-06 | no |
| Ethylene | 1.97E-02 | NV | | na | 6.91E+00 | 4.60E+05 | 1.50E-05 | no |
| Acetylene | 2.05E-02 | NV | | na | 1.79E+00 | NA | | na |
| Ethane | 1.17E-03 | NV | | na | 1.02E-01 | NA | | na |
| Propylene | 1.60E-03 | NV | | na | 1.40E-01 | NA | | na |
| Propane | NA | NV | | na | NA | 3.78E+06 | | na |
| Propyne (methyl acetylene) | 8.03E-04 | NV | | na | 2.82E-01 | 2.79E+06 | 1.01E-07 | no |
| Isobutane | NA | NV | | na | NA | 9.52E+05 | | na |
| 1-Butene/Isobutylene (115-11-7) | NA | NV | | na | NA | 6.87E+06 | | na |
| 1,3-Butadiene/butane | NA | 3.74E-03 | | na | NA | 2.20E+04 | | na |
| cis-butene | NA | NV | | na | NA | 1.72E+04 | | na |
| 1-Butyne | NA | NV | | na | NA | NA | | na |
| trans-Butene | NA | NV | | na | NA | 1.72E+04 | | na |
| 2-Butyne (crotonylene) | NA | NV | | na | NA | NA | | na |
| n-Pentane | NA | NV | | na | NA | 1.80E+06 | | na |
| n-Hexane | NA | 2.10E+02 | | na | NA | 5.28E+05 | | na |
| SVOCs | | | | | | | | |
| n-nitrosodimethylamine | NA | 1.37E-04 | | na | NA | 2.50E+03 | | na |
| bis(2-chloroethyl)ether | NA | 5.82E-03 | | na | NA | 5.85E+04 | | na |
| phenol | NA | 2.19E+03 | | na | NA | 3.85E+04 | | na |
| 2-chlorophenol | NA | 1.83E+01 | | na | NA | 5.25E+03 | | na |
| 1,3-Dichlorobenzene | NA | 3.29E+00 | | na | NA | 3.61E+04 | | na |
| 1,4-dichlorobenzene | NA | 3.06E-01 | | na | NA | 6.61E+05 | | na |
| 1,2-dichlorobenzene | NA | 2.09E+02 | | na | NA | 3.01E+05 | | na |
| benzyl alcohol | NA | 1.10E+03 | | na | NA | 5.53E+04 | | na |

Table D-1: Comparison of Air Concentrations With Health-Based Values

| Cartridge, 5.56-mm Ball Practice, M862 (M16A1) DODIC: A065 | | | | | | | | |
|---|--|---|--------------------------------|------|--|---|--------------------------|------|
| Compound | C _{chronic} (µg/m ³) | Health-Based Screening Level (µg/m ³) | C _{chronic} / HBSL | > 1? | C _{acute} (µg/m ³) | Acute Toxiclty Value (µg/m ³) | C _{acute} / ATV | > 1? |
| bis(2-chloroisopropyl)ether | NA | 1.92E-01 | | na | NA | 6.99E+04 | | na |
| 2-methylphenol | NA | 1.83E+02 | | na | NA | NA | | na |
| hexachloroethane | NA | 4.80E-01 | | na | NA | 2.90E+04 | | na |
| n-nitroso-di-n-propylamine | NA | 9.61E-04 | | na | NA | 2.00E+02 | | na |
| 4-methylphenol | NA | 1.83E+02 | | na | NA | NA | | na |
| nitrobenzene | NA | 2.09E+00 | | na | NA | 1.51E+04 | | na |
| isophorone | NA | 7.08E+00 | | na | NA | 2.83E+04 | | na |
| 2-nitrophenol | NA | NV | | na | NA | NA | | na |
| 2,4-dimethylphenol | NA | 7.30E+01 | | na | NA | NA | | na |
| bis(2-chloroethoxy)methane | NA | NV | | na | NA | NA | | na |
| 2,4-dichlorophenol | NA | 1.10E+01 | | na | NA | 3.00E+04 | | na |
| 1,2,4-trichlorobenzene | NA | 2.08E+02 | | na | NA | 3.71E+04 | | na |
| naphthalene | 2.10E-04 | 3.13E+00 | 6.73E-05 | no | 7.37E-02 | 7.86E+04 | 9.38E-07 | no |
| 4-chloroaniline | NA | 1.46E+01 | | na | NA | 3.00E+04 | | na |
| hexachlorobutadiene | NA | 8.62E-02 | | na | NA | 3.21E+04 | | na |
| 4-chloro-3-methylphenol | NA | NV | | na | NA | 2.00E+04 | | na |
| 2-methylnaphthalene | NA | 7.30E+01 | | na | NA | 2.00E+04 | | na |
| hexachlorocyclopentadiene | NA | 7.30E-02 | | na | NA | 2.23E+02 | | na |
| 2,4,6-trichlorophenol | NA | 1.10E+02 | | na | NA | 3.00E+04 | | na |
| 2,4,5-trichlorophenol | NA | 3.65E+02 | | na | NA | 3.00E+04 | | na |
| 2-chloronaphthalene | NA | 2.92E+02 | | na | NA | 6.00E+02 | | na |
| 2-nitroaniline | NA | 2.09E-01 | | na | NA | NA | | na |
| Acenaphthylene | NA | NV | | na | NA | 2.00E+02 | | na |
| dimethylphtalate | NA | 3.65E+04 | | na | NA | 1.50E+04 | | na |
| 2,6-dinitrotoluene | NA | 3.65E+00 | | na | NA | 6.00E+02 | | na |
| acenaphthene | NA | 2.19E+02 | | na | NA | 1.25E+03 | | na |
| 3-nitroaniline | NA | NV | | na | NA | NA | | na |
| 2,4-dinitrophenol | NA | 7.30E+00 | | na | NA | 7.50E+03 | | na |
| dibenzofuran | NA | 1.46E+01 | | na | NA | NA | | na |
| 2,4-dinitrotoluene | NA | 7.30E+00 | | na | NA | 6.00E+02 | | na |
| 4-nitrophenol | NA | 2.92E+01 | | na | NA | 3.00E+04 | | na |
| Fluorene | NA | 1.46E+02 | | na | NA | 7.50E+04 | | na |

Table D-1: Comparison of Air Concentrations With Health-Based Values

| Cartridge, 5.56-mm Ball Practice, M862 (M16A1) DODIC: A065 | | | | | | | | |
|---|--|---|--------------------------------|------|--|---|-------------------------|------|
| Compound | C _{chronic} (µg/m ³) | Health-Based Screening Level (µg/m ³) | C _{chronic} / HBSL | > 1? | C _{acute} (µg/m ³) | Acute Toxicity Value (µg/m ³) | C _{acute} /ATV | > 1? |
| 4-chlorophenyl-phenylether | NA | NV | | na | NA | NA | | na |
| diethylphthalate | NA | 2.92E+03 | | na | NA | 1.50E+04 | | na |
| 4-nitroaniline | NA | NV | | na | NA | 9.00E+03 | | na |
| 4,6-dinitro-2-methylphenol | NA | 3.65E-01 | | na | NA | 5.00E+02 | | na |
| n-nitrosodiphenylamine(1) | NA | 1.37E+00 | | na | NA | NA | | na |
| 4-bromophenyl-phenylether | NA | NV | | na | NA | NA | | na |
| hexachlorobenzene | NA | 4.18E-03 | | na | NA | 7.50E+01 | | na |
| pentachlorophenol | NA | 5.60E-02 | | na | NA | 1.50E+03 | | na |
| phenanthrene | NA | NV | | na | NA | 2.00E+03 | | na |
| anthracene | NA | 1.10E+03 | | na | NA | 6.00E+03 | | na |
| di-n-butylphthalate | NA | 3.65E+02 | | na | NA | 1.50E+04 | | na |
| fluoranthene | NA | 1.46E+02 | | na | NA | 3.00E+01 | | na |
| pyrene | NA | 1.10E+02 | | na | NA | 1.50E+04 | | na |
| butylbenzylphthalate | NA | 7.30E+02 | | na | NA | 5.00E+05 | | na |
| benzo(a)anthracene | NA | 2.17E-02 | | na | NA | 6.00E+02 | | na |
| chrysene | NA | 2.17E+00 | | na | NA | 2.00E+02 | | na |
| 3,3-dichlorobenzidine | NA | 1.50E-02 | | na | NA | 6.21E+03 | | na |
| bis(2-ethylhexyl)phthalate | 1.15E-05 | 4.80E-01 | 2.40E-05 | no | 9.41E-03 | 1.00E+04 | 9.41E-07 | no |
| di-n-octylphthalate | NA | 7.30E+01 | | na | NA | 1.50E+05 | | na |
| benzo(b)fluoranthene | NA | 2.17E-02 | | na | NA | NA | | na |
| benzo(k)fluoranthene | NA | 2.17E-01 | | na | NA | NA | | na |
| benzo(a)pyrene | NA | 2.17E-03 | | na | NA | 7.50E+03 | | na |
| indeno(1,2,3-cd)pyrene | NA | 2.17E-02 | | na | NA | NA | | na |
| dlbenz(a,h)anthracene | NA | 2.17E-03 | | na | NA | 3.00E+04 | | na |
| benzo(g,h,i)perylene | NA | NV | | na | NA | 3.00E+04 | | na |
| TO-13 (PAHs) | | | | | | | | |
| naphthalene | 1.78E-04 | 3.13E+00 | 5.70E-05 | no | 6.24E-02 | 7.86E+04 | 7.94E-07 | no |
| acenaphthylene | 1.35E-05 | NV | | na | 4.73E-03 | 2.00E+02 | 2.37E-05 | no |
| Acenaphthene | 6.98E-07 | 2.19E+02 | 3.19E-09 | no | 2.44E-04 | 1.25E+03 | 1.96E-07 | no |
| fluorene | 1.65E-06 | 1.46E+02 | 1.13E-08 | no | 5.78E-04 | 7.50E+04 | 7.71E-09 | no |
| phenanthrene | 3.45E-06 | NV | | na | 1.21E-03 | 2.00E+03 | 6.04E-07 | no |

Table D-1: Comparison of Air Concentrations With Health-Based Values

| Cartridge, 5.56-mm Ball Practice, M862 (M16A1) DODIC: A065 | | | | | | | |
|---|--|---|--------------------------------|------|--|---|---------------------------------|
| Compound | C _{chronic} (µg/m ³) | Health-Based Screening Level (µg/m ³) | C _{chronic} / HBSL | > 1? | C _{acute} (µg/m ³) | Acute Toxicity Value (µg/m ³) | C _{acute} /ATV > 1? |
| anthracene | 3.70E-07 | 1.10E+03 | 3.38E-10 | no | 1.30E-04 | 6.00E+03 | 2.16E-08 |
| fluoranthene | 1.14E-05 | 1.46E+02 | 7.79E-08 | no | 3.98E-03 | 3.00E+01 | 1.33E-04 |
| pyrene | 3.51E-05 | 1.10E+02 | 3.21E-07 | no | 1.23E-02 | 1.50E+04 | 8.20E-07 |
| benzo(a)anthracene | 9.70E-07 | 2.17E-02 | 4.47E-05 | no | 7.93E-04 | 6.00E+02 | 1.32E-06 |
| chrysene | 1.20E-06 | 2.17E+00 | 5.51E-07 | no | 9.77E-04 | 2.00E+02 | 4.89E-06 |
| benzo(b)fluoranthene | 1.82E-06 | 2.17E-02 | 8.37E-05 | no | 3.71E-04 | NA | na |
| benzo(k)fluoranthene | 1.16E-06 | 2.17E-01 | 5.34E-06 | no | 2.37E-04 | NA | na |
| Benzo(e)pyrene | 1.02E-05 | NV | | na | 8.96E-04 | NA | na |
| benzo(a)pyrene | 3.84E-06 | 2.17E-03 | 1.77E-03 | no | 3.14E-03 | 7.50E+03 | 4.18E-07 |
| indeno(1,2,3-cd)pyrene | 5.61E-06 | 2.17E-02 | 2.59E-04 | no | 1.15E-03 | NA | na |
| dibenz(a,h)anthracene | NA | 2.17E-03 | | na | NA | 3.00E+04 | na |
| benzo(g,h,i)perylene | 3.56E-05 | NV | | na | 1.25E-02 | 3.00E+04 | 4.15E-07 |
| Dioxins and Furans | | | | | | | |
| 2378-Tetrachlorodibenzo-p-dioxin | NA | 4.48E-08 | | na | NA | 3.50E+00 | na |
| 12378-Pentachlorodibenzo-p-dioxin | NA | NV | | na | NA | 2.50E+00 | na |
| 123478-Hexachlorodibenzo-p-dioxin | NA | NV | | na | NA | NA | na |
| 123678-Hexachlorodibenzo-p-dioxin | NA | NV | | na | NA | 1.50E+01 | na |
| 123789-Hexachlorodibenzo-p-dioxin | NA | 1.48E-06 | | na | NA | NA | na |
| 1234678-Heptachlorodibenzo-p-dioxin | 3.31E-11 | NV | | na | 2.90E-09 | NA | na |
| OCDD | | | | | | | |
| 2378-Tetrachlorodibenzo-p-furan | 5.92E-10 | NV | | na | 2.07E-07 | 1.50E+02 | 1.38E-09 |
| 12378-Pentachlorodibenzo-p-furan | NA | NV | | na | NA | 2.00E+00 | na |
| 23478-Pentachlorodibenzo-o-furan | NA | NV | | na | NA | NA | na |
| 123478-Hexachlorodibenzo-p-furan | NA | NV | | na | NA | 7.50E-02 | na |
| 123678-Hexachlorodibenzo-p-furan | NA | NV | | na | NA | 7.50E+00 | na |
| 123789-Hexachlorodibenzo-p-furan | NA | NV | | na | NA | 2.50E+00 | na |
| 234678-Hexachlorodibenzo-p-furan | NA | NV | | na | NA | NA | na |
| 1234678-Heptachlorodibenzo-p-furan | NA | NV | | na | NA | 1.50E+00 | na |
| 1234789-Heptachlorodibenzo-p-furan | NA | NV | | na | NA | NA | na |
| OCDF | 1.78E-11 | NV | | na | 6.24E-09 | 3.00E+02 | 2.08E-11 |
| Energetics | | | | | | | |
| Nitrobenzene | NA | 2.09E+00 | | na | NA | 1.51E+04 | na |

Table D-1: Comparison of Air Concentrations With Health-Based Values

| Cartridge, 5.56-mm Ball Practice, M862 (M16A1) DODIC: A065 | | | | | | | |
|---|--|---|--------------------------------|------|--|---|-------------------------|
| Compound | C _{chronic} (µg/m ³) | Health-Based Screening Level (µg/m ³) | C _{chronic} / HBSL | > 1? | C _{acute} (µg/m ³) | Acute Toxicity Value (µg/m ³) | C _{acute} /ATV |
| 2-Nitrotoluene | NA | 3.65E+01 | | na | NA | NA | na |
| 3-Nitrotoluene | NA | 3.65E+01 | | na | NA | NA | na |
| 4-Nitrotoluene | NA | 3.65E+01 | | na | NA | 3.37E+04 | na |
| Nitroglycerine | NA | 4.80E-01 | | na | NA | NA | na |
| 1,3-Dinitrobenzene | NA | 3.65E-01 | | na | NA | 3.00E+03 | na |
| 2,6-Dinitrotoluene | NA | 3.65E+00 | | na | NA | 6.00E+02 | na |
| 2,4-Dinitrotoluene | NA | 7.30E+00 | | na | NA | 6.00E+02 | na |
| 1,3,5-Trinitrobenzene | NA | 1.10E+02 | | na | NA | 3.00E+04 | na |
| 2,4,6-Trinitrotoluene | NA | 2.24E-01 | | na | NA | 2.50E+04 | na |
| RDX | NA | 6.11E-02 | | na | NA | NA | na |
| 4-Amino-2,6-Dinitrotoluene | NA | NV | | na | NA | NA | na |
| 2-Amino-2,6-Dinitrotoluene | NA | NV | | na | NA | 1.50E+04 | na |
| Tetryl | NA | 3.65E+01 | | na | NA | NA | na |
| HMX | NA | 1.83E+02 | | na | NA | NA | na |
| Pentaerythritoltetranitrate | NA | NV | | na | NA | 5.00E+01 | na |
| Dibutyl Phthalate | NA | 3.65E+02 | | na | NA | 1.50E+04 | na |
| Diethyl Phthalate | NA | 4.80E-01 | | na | NA | 1.00E+04 | na |
| Diphenylamine | NA | 9.13E+01 | | na | NA | 3.00E+04 | na |
| Footnotes: | | | | | | | |
| NA: Not applicable because compound was not detected. | | | | | | | |
| na: Not available because health-based screening value is not available or not applicable if compound was not detected. | | | | | | | |
| NV: No value available. | | | | | | | |
| C _{chronic} : Chronic time-averaged concentration | | | | | | | |
| HBSL: Chronic health-based screening level | | | | | | | |
| C _{acute} : acute concentration | | | | | | | |
| ATV: Acute toxicity value | | | | | | | |

Table D-2: Comparison of Air Concentrations With Health-Based Values: Total Petroleum Hydrocarbons

| Cartridge, 5.56-mm Ball Practice, M862 (M16A1) DODIC: A065 | | | | |
|---|--|--|--|--|
| Compound (a) | C _{chronic} (µg/m ³) | C _{chronic} (µg/m ³) | C _{chronic} (µg/m ³) | C _{chronic} (µg/m ³) |
| | Aliphatic: C ≤ 8 | Aliphatic: C > 8 | Aromatic: C ≤ 8 | Aromatic: C > 8 |
| Hexane | 1.02E-02 | NA | NA | NA |
| Benzene | NA | NA | 7.52E-03 | NA |
| Toluene | NA | NA | 3.55E-04 | NA |
| m&p-Xylene | NA | NA | 2.72E-05 | NA |
| o-Xylene | NA | NA | 6.89E-05 | NA |
| Styrene | NA | NA | NA | 6.76E-05 |
| 1,2,4-Trimethylbenzene | NA | NA | NA | 2.31E-05 |
| Propylene | 1.60E-03 | NA | NA | NA |
| Propyne (methyl acetylene) | 8.03E-04 | NA | NA | NA |
| naphthalene | NA | NA | NA | 2.10E-04 |
| naphthalene | NA | NA | NA | 1.78E-04 |
| acenaphthylene | NA | NA | NA | 1.36E-05 |
| Acenaphthene | NA | NA | NA | 6.98E-07 |
| fluorene | NA | NA | NA | 1.65E-06 |
| phenanthrene | NA | NA | NA | 3.45E-06 |
| anthracene | NA | NA | NA | 3.70E-07 |
| fluoranthene | NA | NA | NA | 1.14E-05 |
| Total (µg/m ³) | 1.26E-02 | 0.00E+00 | 7.97E-03 | 5.10E-04 |
| Derived Health-Based Screening Level | 1.92E+04 | 1.04E+03 | 4.17E+02 | 2.09E+02 |
| C _{chronic} /HBSL | 6.57E-07 | 0.00E+00 | 1.91E-05 | 2.45E-06 |
| >1? | no | no | no | no |
| Footnotes: >1? = Is the ratio greater than one? NA = Not Applicable because compound was not detected C _{chronic} = chronic averaged air Concentration HBSL = Health-Based Screening Level | | | | |

APPENDIX E

**FACT SHEET SUBMITTED TO THE
U.S. ARMY ENVIRONMENTAL CENTER**

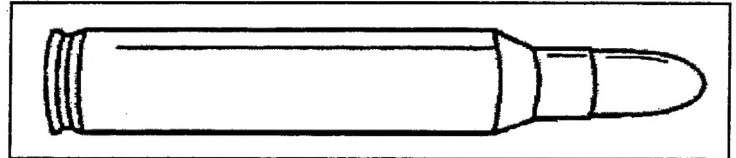
U.S. Army Environmental Center

Training Munitions Fact Sheet

M862 5.56-mm Practice Cartridge

Department of Defense Identification Code: A065

Breathing air emissions from the M862 5.56-mm practice cartridge will not impact the health of residents who live near Army training facilities.



To be fully prepared to protect our country, U.S. soldiers must train with many different weapons and munitions, including the M862 5.56-mm practice cartridge. This training is important because it helps prepare our soldiers for a variety of combat situations. While the Army recognizes the value of such comprehensive training on our installations, we also work hard to ensure the safety and health of surrounding communities.

WILL BREATHING AIR EMISSIONS FROM THE M862 5.56-MM PRACTICE CARTRIDGE AFFECT MY HEALTH?

To answer this question, the U.S. Army tested the air emissions that are released when the M862 is fired. The information gathered during these tests was then analyzed to determine if there would be a potential for health effects from inhalation to residents who live near training areas. Study results, generated using conservative methods, showed that offsite residents breathing air as close as 100 meters (328 feet or about the length of a football field) from the firing location are safe from these emissions. At most locations, training areas are at least 1,000 meters (over half a mile) away from populated areas and the distance to firing locations may be even farther.

HOW WAS THE STUDY CONDUCTED?

To gather data for this study, the M862 was fired from the M16A2 rifle with the M2 practice bolt in a test chamber. The air in the chamber was then tested to identify the types and amounts of substances released. About 300 different substances were looked for during this part of the study.

This information was then used in an U.S. Environmental Protection Agency (USEPA) approved air model (a computer program that allows estimation of air concentrations) to determine the amount of each substance to which someone living near a training site might be exposed. Downwind concentrations were estimated based on a typical use scenario for the M862 during training exercises.

Since this study did not look at any one specific training area, the assumptions used in the model would, in most cases, predict higher downwind air concentrations than those expected at an actual training site.

These estimated air concentrations were then compared to screening levels established by the USEPA and other federal agencies. If the air concentrations are less than these screening levels, they are considered safe for the general population, including sensitive people such as the sick, elderly, and children.

WHAT ARE THE STUDY LIMITATIONS?

Many steps were taken to ensure that the results of this study are protective of residents who live near training facilities. However, as with any study, this study has limitations. For example, the study does not consider exposure to other types of munitions that could also be used during the same training event. Due to these limitations, conservative model conditions were used to ensure the protection of public health from breathing M862 air emissions.

WHAT EXACTLY IS THE M862 5.56-MM PRACTICE CARTRIDGE?

The M862 is a practice cartridge used most often on indoor ranges or on local or urban training areas that do not allow firing of service ammunition. Although the M862 can reach a maximum distance of 250 meters (820 feet), it is most effective as a training alternative to other service ammunition at a distance of 25 meters (82 feet) or less. Therefore, the M862 is typically used for firing exercises of 25 meters or less. Each M862 cartridge consists of a copper alloy cartridge case and a plastic bullet and can be identified by its blue tip.

WHERE CAN I GET MORE INFORMATION?

For more information on the M862 or other military munitions, please call the Army Environmental Hotline at 1-800-USA-3845, visit our Web site at www.aec.army.mil, or e-mail t2hotline@aec.apgea.army.mil.